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DEFORMITIES OF THE MOUTH

THEIR MECHANICAL TREATMENT

BY

OAKLEY COLES

SECOND EDITION.

MECHANICAL TREATMENT

OF

DEFORMITIES OF THE MOUTH.

SECOND EDITION.

ON

DEFORMITIES OF THE MOUTH,

CONGENITAL AND ACQUIRED,

WITH

THEIR MECHANICAL TREATMENT.

BY

JAMES OAKLEY COLES,

HONORARY DENTIST TO THE HOSPITAL FOR DISEASES OF THE THROAT, GOLDEN SQUARE;
MEMBER OF THE ODONTOLOGICAL SOCIETY OF GREAT BRITAIN, ETC.

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TO

SIR WILLIAM FERGUSSON, BART., F.R.S.,

SERGEANT-SURGEON TO THE QUEEN,

THIS VOLUME IS RESPECTFULLY DEDICATED

BY THE AUTHOR.

CONTENTS.

—:o:—

CHAPTER I.

PAGE

On the Origin and Development of Congenital Cleft Palate.—On the Theory of its Transmission from Parent to Offspring 5

CHAPTER II.

On the Anatomy and Physiology of Congenital Cleft Palate.—Description of a Case dissected by Sir William Fergusson.—Mr. Christopher Heath's Case.—State of the upper part of Pharynx and Posterior Nares 14

CHAPTER III.

On the troubles arising from Congenital Cleft Palate.—Difficulty of Suckling during Infancy.—Artificial Palate to be worn on the Mother's Breast.—Retarded Development of the Body from Insufficiency of Nutriment.— Defective Speech.—Inflamed state of Nares, Fauces, &c. 31

CHAPTER IV.

An account of Appliances for Remedying Cleft Palate, congenital and acquired, from A.D. 1552. 40

CHAPTER V.

On taking the Impression for an Artificial Palate.—Making the Plaster and Metallic Moulds.—Vulcanite, Vulcanizing.—Making the Front Piece, &c. 60

CHAPTER VI.

PAGE

On the Introduction of the Instrument into the Mouth.—Subsequent Tuition.—Value of Singing in facilitating the proper use of the parts.—Impediments to Production of Perfect Voice and Speech 77

CHAPTER VII.

An account of Cases of Cleft Palate and other Congenital Deformities of the Mouth 85

CHAPTER VIII.

Defects of the Palate arising from Syphilis 100

CHAPTER IX. AND APPENDIX.

Conclusions as to the best Mode of treating Deformities of the Mouth, based on the treatment of fifty-eight Cases by the Author 123

PREFACE TO THE FIRST EDITION.

—:o:—

IN bringing this volume before the members of the Dental and Medical profession, I desire to state my reasons for thinking that such a work would not be unacceptable. For some few years past the treatment of Congenital Cleft Palate has formed a subject of considerable discussion before both Medical and Dental societies; and our journals have always been ready to receive communications on a matter that seemed to command so much attention.

The recent advances that have been made in the mechanical treatment of this deformity have not lessened the interest that had already arisen; and as no publication on the mode of procedure and account of cases had appeared since the time of Snell, in 1828,—apart from reprints of papers read before the learned societies,—I was induced to think that the present book, though by no means so complete as the subject deserves, would be of interest to those gentlemen who have devoted time and attention to this speciality, as well as to the general practitioner.

Where I have given descriptions of the *modus operandi* of any part of the treatment put forward, I trust I shall have been found to be sufficiently

explicit; and in the chapter on the appliances used in the past, and at the present time by other gentlemen, I hope it will be recognised that I have endeavoured to be impartial.

In reference to the account of cases, treated by mechanical means, of loss of parts arising from accidental causes, I feel some explanation is necessary. The novelty in these instances does not consist so much in the general line of treatment adopted, as in the fact that where elastic rubber has been used it has been adapted in metallic moulds, made expressly for each case, to the outline of the deficiency which it was intended to supply; the facility with which this can be done being considerably increased since the first manufacture of elastic rubber in this country, about eighteen months since, so pure and so carefully prepared as to be suitable for dental purposes. Before this date we were dependent on America for our supply.

I have to thank many medical and professional brethren for the cases they have placed in my hands for treatment; but there are obvious reasons for my not mentioning their names in those instances where I have given a report of the treatment pursued.

81, Wimpole Street, Cavendish Square, W.,
October, 1868.

PREFACE TO THE SECOND EDITION.

—:o:—

The favourable reception of the first Edition of this work by the Medical Press and Profession, both in England and America, has shown that it was not altogether an unnecessary contribution to Dental literature.

The alterations and additions I have now made will, I trust, render it not less worthy of the considerate notice with which it has been already received.

I cannot but express my deep obligations to my friends, Dr. Morell-Mackenzie and Mr. Christopher Heath, for their great kindness in placing cases and preparations at my disposal, during the progress of this second Edition through the press.

In the former Edition of this Work I enjoyed the co-operation of Mr. Robert Ramsay, but being no longer connected with that gentleman, I am alone responsible for the present volume.

81, Wimpole Street, Cavendish Square, W.

May, 1870.

DEFORMITIES OF THE MOUTH.

—:o:—

CHAPTER I.

ON THE ORIGIN AND DEVELOPMENT OF CLEFT PALATE.

THE predisposing causes of cleft palate have often been a matter of careful research and reflection; but up to the present time no satisfactory reason has been given for the development of this deformity. It has occasioned great speculation and conjecture, but we cannot affirm that we are any nearer the truth now than we were many years ago. That it is in some instances caused by arrested development, the want of substance in the parts would seem to indicate; but in others it is apparently more from a want of union in the median line at the proper time than from any lack of material to produce the perfect palate, since the margins of the cleft in many cases supply more than enough to fill up the deficiency in the operation of staphyloraphy, while in others again no amount of skill would be able to bring the opposite sides into such contact as to get permanent union. This variety would then appear to point to the fact, that while in some cases

the lesion may occur from arrested development during the whole time of pregnancy, in others it occurs only at that time when the parts should unite in the central portions, this condition being consequent, according to Dr. Engel's opinion, to increased breadth of the anterior portion of the head, which is again caused by a variety of conditions in embryonic life, such as congenital hernia cerebri, dropsy of the third ventricle, or of the anterior cornua of the lateral ventricles, or excessive development of the anterior cerebral lobes.

This view of the case becomes the more intelligible if we refer to the statements of embryologists as to the condition of the embryo about the thirty-eighth day.

The annexed woodcut, copied from the work of M. Coste, shows the manner in which the parts ultimately producing the cavity of the mouth and the adjacent structures are developed.

The superior maxillary bones, the lower jaw, and two of the bones of the ear are developed from the first of a series of arches, the two halves of which are separated by a space immediately below the frontal eminence.

The jaws being thus developed in two segments, meeting in the median portion under natural circumstances, and the central portion of the lip being developed from a separate part to that of each side, we can readily understand how the

arrest of development of any of these parts for ever so brief a time at this period of embryonic life would lead to great deformity.

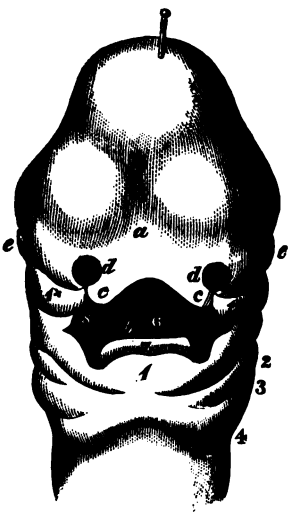


FIG. 1.

Mouth of the embryo at the 38th day.

a. Median bud.
c c. Incisor buds.
d d. Nostrils.
e e. The eyes.
b. The mouth.
1. The lower jaw.
1*. Superior maxillary bones.
2, 3, and 4. Second, third, and fourth visceral arches.
6. Septum of the nose.
7. The tongue.
8. Roof of the mouth.

In consequence of the distension within the cranium of the embryo, the parts on each side of the palatal fissure appear to be not only deficient in the median line, but more widely separated than under the natural condition they would

be; the distance between certain parts, such as the infra-orbital foramina and nasal processes of the upper maxillary bones, being taken as points for comparison with measurements from the same parts in the healthy new-born child.

Dr. John Smith, of Edinburgh, brought this matter prominently before the scientific world by reading a paper on "Certain Points in the Morphology of Cleft Palate" at a meeting of the Royal Society of Edinburgh, and gave to the subject additional interest by his philosophical reflections on the connection between the measurements taken at birth and those obtained from the mouths of adult cases. Having taken the first bicuspid of each side as a point of measurement, (as the least change takes place here from infancy to adult life) in the normal dental arch averaging from one and an eighth to one and a quarter of an inch, Dr. Smith gives the measurement of sixteen cases of congenital cleft palate, in the full-grown subject, which show an average width somewhat less than in the perfectly formed jaw.

"In six cases where the intermaxillary bones seemed altogether absent—probably instances of double cleft where they had been removed by the surgeon, or where they had never been developed—

1 case measured $\frac{3}{8}$ of an inch,
1 „ $\frac{5}{8}$ „

2 cases measured $\frac{7}{8}$ of an inch.
1 „ 1 inch,
1 „ $1\frac{1}{8}$ of an inch,

giving an average measurement of between $\frac{6}{8}$ and $\frac{7}{8}$ of an inch.

"In ten cases of simple cleft palate alone, or of cleft palate combined with only unilateral fissure,

1 case measured $\frac{5}{8}$ to $\frac{6}{8}$ of an inch,
1 „ $\frac{5}{8}$ of an inch,
4 „ $\frac{7}{8}$ „
3 „ 1 inch,
1 „ $1\frac{1}{8}$ of an inch,

giving an average measurement of $\frac{7}{8}$ of an inch."

Dr. Smith then goes on to say that it would thus appear that while in the infant there is abnormal separation, in the adult there occurs abnormal approximation of the parts on each side of the fissure, as in fig. 2.

To a certain extent this approximation of parts may be fortuitous—a misdirection of growth, dependent upon the absence of the mesial structures, while the superior maxilla is becoming, as age advances, elongated downwards by the expansion of the antrum.

But as the same approximation seems to occur even where only a partial fissure exists—the cleft being limited to the palate, while the maxillary arch is throughout complete—there is reason to conclude that it is in some measure to be

considered as an effort on the part of nature towards reparation, or rather amelioration of the existing defect.

Fig. 2.

I had for some time previous to the reading of Dr. Smith's paper been attracted to the subject of which it treats in the latter portion, by a number of cases giving most marked evidence of this approximation in the region of the first and second bicuspids, though I had not thought to apply to it the idea of its being a natural effort to decrease the size of the cleft.

I came then to the conclusion, and have had

no reason up to the present time to doubt its soundness, that it was rather owing to the pressure exerted by the eruption of the molars, than to any movement originating *per se* in the portion of the jaw indicated by the position of the bicuspids.

If the upper jaw be taken as representing an arch, it will, I think, be admitted that where the bicuspids are developed would be the weakest part of that arch, and supposing the central portion to be well developed and of a symmetrical shape, any pressure applied from behind forwards would produce irregularity. With a perfect palate such pressure will in the upper jaw very often produce a bulging out of the bicuspids; in the cleft palate, the median portion (which in the natural state ties the two piers together) being absent, the molars are to some extent separated, while the first bicuspids are approximated.

As curiously corroborative of this view of the matter, I would submit the instances of irregularity that occur in the lower jaw, where we have a condition somewhat analogous to the imperfect arch, caused by cleft palate in the upper jaw. On account of the absence of any strong tie between the two angles of the dental arch in the inferior maxilla, it is often seen when the wisdom teeth are erupted, and all the other teeth are perfect and in good position, that the

bicuspids will in some rare cases sink below the level of the rest of the lower teeth, in consequence of the absorption produced by the pressure from behind forwards, and in many cases an approximation of them takes place towards each other identical with that which I have brought forward as occurring from a similar cause in the upper jaw.

This is further corroborated by the fact, that in the first dentition, in the simple cleft there is no deformity of the dental arch. This is shown in fig. 3, the model of a child's mouth at four years of age, and drawings of several other casts could be shown in proof of the same fact.

FIG. 3.

On these grounds, therefore, I would, with all deference, submit this view of the case to my professional readers.

Whether cleft palate is hereditary or not it seems impossible to determine, though from the evidence we have in hand I should come to the conclusion that it is not. Still, unless one could obtain accurate records of ancestry for three or four degrees of removal, it would be impossible to assert anything with certainty. I feel, however, that it may confidently be asserted that this deformity cannot be produced from any impression received by the mother during pregnancy, for in every case which has come immediately under my notice, where one of the parents has had cleft palate, all the children born have been perfectly developed, even though dread on the part of the mother of transmitting the deformity has been most constant.

In one case, curiously enough, there are three members of one family with cleft palate, one seventeen years of age, the other thirty, and the third thirty-five; the first and last are ladies, the other a gentleman, who has married, and has a family without any trace of the father's deformity. In these cases no instances of cleft palate could be found either among ancestors or collateral branches of the family. It will be interesting to watch whether in the following generations any traces spring up again, for no cases of immediate transmission seem to have been placed on record.

CHAPTER II.

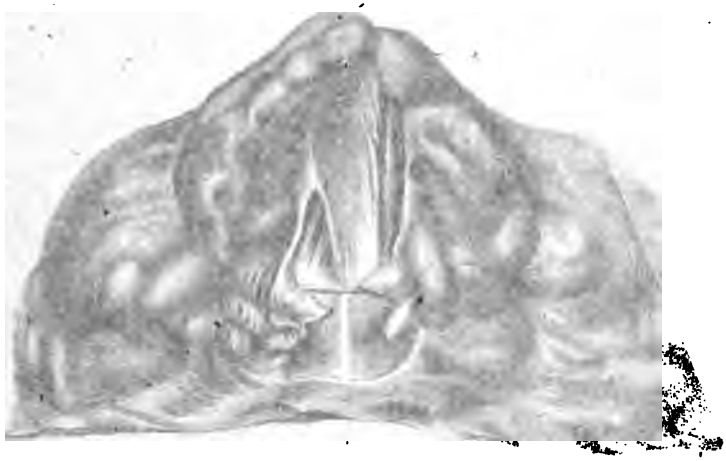
ON THE ANATOMY AND PHYSIOLOGY OF CLEFT PALATE.

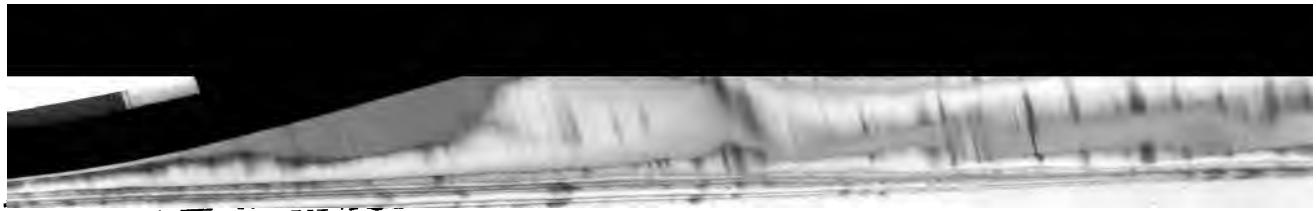
Congenital cleft of the palate may be found in the soft palate alone, or extending into the hard palate also. Sometimes it passes through the alveolar ridge as well as the hard and soft palate, and in some rare cases it is confined to a division of the alveolar ridge alone, leaving the hard and soft palate perfect. When the fissure extends through the entire maxillæ, we sometimes see double cleft of the palate, as shown in plates 1 and 2.

These drawings have been most faithfully copied from the skull and original drawing of the mouth, in the possession of my friend Mr. Christopher Heath, to whom I am greatly indebted for the privilege of presenting this interesting case to my readers.

Mr. Heath was kind enough also to give me the opportunity of witnessing an operation, which he performed for the hare lip, on a little patient having a double cleft palate of the same character as that shown in plates 1 and 2. It is rather curious to notice how the change takes place, from the state of the palate when the child is born, to that which it presents at about ten or twelve

Plate 1





W West lith

years of age; the operation for hare lip having been performed during infancy.

The dental arch instead of having the breadth (in comparison with the size of the rest of the head,) of the normal jaw is found to be exceedingly contracted, the two margins of the fissure in the alveolar ridge being very near together, if not in actual contact with each other.

By this time the portion of the palate, that in childhood produced the appearance of a double cleft will have changed its position, and the patient will have that form of palate, which is found in most of these severe cases.

All this is produced, I think, by the contraction of the lip after the operation has been performed on it. The steady pressure which, as the wound heals, is exerted on the two portions of the jaw, gradually approximates the anterior margins of the cleft, and at the same time compels the central portion of the palate to which I have drawn attention, to assume a vertical instead of an horizontal position, as at birth. A careful examination of the drawings in reference to this matter, will I think bear out this view.

For the anatomy of cleft palate I am largely indebted to Sir William Fergusson, who some years back had the rare good fortune to come across a case in the dissecting-room, an account of which he gave in a paper read before the

Medical and Chirurgical Society on the 10th December, 1844. On the conclusions which he came to as to the physiology of the parts, he based his method of treatment for this condition of the palate, and put forward the plan of dividing the levator palati muscle, in order to obtain perfect control over the palate during the operation.

The value of this account of the anatomy and physiology of cleft palate cannot be overestimated, since, in addition to the light it threw upon the surgeon's work, it has of late years become the basis of treatment by mechanical means.

Under these circumstances I feel I cannot do better than give to my readers an extract from the Society's Transactions (for 1845), in Sir William Fergusson's own words:—

"Few have had the opportunity of dissecting a cleft palate, and some notice of a specimen in my possession will form an appropriate introduction to the views developed in this paper. The fissure in this instance implicates a portion of the hard as well as the whole soft palate, and is such as the surgeon frequently meets with in practice. The specimen was procured in the dissecting-room from the mouth of an aged female subject.

"In the examination of this preparation there

are several marked differences between it and the parts in a more natural state. The superior constrictor muscle is more fully developed than under ordinary circumstances, and its upper margin, extending between the basilar process of the occipital bone and the internal pterygoid plate is particularly distinct. This part of the muscle forms a sort of semicircular loop, in which the levator palati muscle seems to be suspended.

"The pharynx has been laid open by a perpendicular incision through the constrictors in the mesial line, and the moveable portion of the palate has been dissected on one side. The circumflexus, or tensor palati, differs little from the natural condition, and the levator palati is much as it is usually met with, its lower end spreading out in all directions on the soft palate. The palato-pharyngeus consists of two distinct bundles of fibres; one, the smaller of the two, running between the tensor and levator palati; the other, a mass equal in size to a goose-quill, seems to form the principal part of the free portion of the palate; and posteriorly its fibres, previous to joining those of the other bundle, form the whole muscular portion of the posterior pillar of the fauces. This muscle arises by tendinous and fleshy fibres from the posterior margin of the osseous palate and the inner surface of the in-

DESCRIPTION OF PLATE 3.

Showing a Dissection of a Cleft Palate; copied from the work on Practical Surgery, by the kind permission of Sir William Fergusson, Bart.

The plate represents the posterior nares and upper surface of the soft palate.

a. The levator palati; the dark line shows where it should be cut across.

b. The inner bundle of fibres of the palato-pharynegus forming the posterior pillar of the fauces; the black line indicates the place for division.

c. The palato-glossus, with the mark for incision, if one should be deemed necessary.

The tonsil lies between these two muscles.

d. The tensor palati, the cartilaginous extremity of the Eustachian tube is in front of this letter.

e. The posterior extremity of the inferior turbinated bone.

f. The septum.

g, g. The uvula on each side stretched apart.

ternal pterygoid plate, and takes its usual course and attachment posteriorly. A bundle of fibres, about the size of a crow-quill, can be traced along the lower border of the inner margin of the soft flap. These fibres extend between the posterior margin of the hard palate and the uvula, and are probably analogous to the azygos uvulæ. The palato-glossus can scarcely be distinguished. A small arterial twig, doubtless a branch of the ascending pharyngeal artery, can be traced between the levator and tensor palati muscles. The throat and upper part of the pharynx generally is smaller than in the well-formed state, but the deficiency in the mesial line of the palate seems more the result of a want of union than of the usual materials of the velum (see page 5).

"The act of deglutition in the natural state of the parts, while food is passing through the upper end of the pharynx, has been a subject of considerable speculation among physiologists, especially with reference to the manner in which the communication betwixt that bag and the posterior nares is closed for the time being.

"It has been pointed out by Dzondi and Müller that the palato-pharyngei muscles, when fixed in the soft tissues at their upper ends—as in the natural state of the velum—must, during contraction, tend towards the mesial line, and so

by their approximation diminish the capacity of the throat. But in the cleft state there is no central fixed line, and each muscle, acting between its extreme attachments—viz., the palatine bones above and the thyroid cartilage below—must, during contraction, tend to widen the throat rather than close it. In the condition alluded to, these muscles, joined with the levatores palati, have the effect of enlarging the gap in the mesial line. It is evident that the doctrine of the above-named physiologists will not account for the closing of the aperture under these circumstances, and how then is the occlusion effected? I am not aware that it has ever been accounted for. Malgaigne,* in describing the simple fissure of the palate, has alluded to the approximation of the edges during deglutition, 'by a muscular action,' as he says, 'of which it is difficult to give an explanation.' I think that any one who looks at the preparation in my possession can have no doubt as to this movement. The superior constrictor has evidently the power of throwing the two lateral portions of the palate forwards and inwards, so that they are forced into contact in the mesial line, and thus the back of the fissure is closed, while the constrictor is acting on the upper part of the pharynx, like a broad semicircular band. The upper border of this

* "Manuel de Médecine Opératoire, Paris, 1834, p. 486.

muscle, as it is seen in the preparation alluded to, must evidently have the effect described, and the lower fibres will act still more effectually, in consequence of there being no connection mesially to prevent them starting forwards during contraction, so as to stretch across, almost in a direct line, extending between the lateral attachments of each muscle. Some of the fibres of the middle constrictor may also aid in this movement. The palato-pharyngei muscles are thus forced into contact, and their ends, behind and below the parts so held in apposition, may then act in the manner described by Müller, while possibly the thickness of the two portions of the soft palate may be increased by the contraction of each palato-pharyngeal muscle at the points of contact. The azygos uvulæ may probably contribute to the latter effect. . . .

"As we look into the open mouth, the flaps may be seen under four different conditions. First. If the parts be not irritated in any way, the gap will be quite conspicuous, the lateral flaps will be distinct, and the posterior nares, with the upper end of the pharynx, will be observed above and behind. Second. If the flaps be touched, they will in all probability be jerked upwards by a motion seemingly commencing at the middle of each. Third. If the parts be further irritated, as by pushing the finger

against them into the fissure, each flap is forcibly drawn upwards and outwards, and can scarcely be distinguished from the rest of the parts, forming the sides of the nostrils and throat. And, fourth. If the parts further back be irritated, as in the second act of deglutition, the margins of the fissure are forced together, by the action of the superior constrictor muscle, already described in my observations on this process, in an earlier part of the paper.

"All these conditions and movements are, in my opinion, very readily accounted for. In the first instance the parts may be deemed in a quiescent state; in the second, the levatores palati are called into play, and move the flaps as described; and in the third, these muscles act still more forcibly, and the palato-pharyngei will join in drawing the parts outwards. The fourth condition I need not again describe.

"If the free margin on one side of the fissure be seized with the forceps, drawn towards the mesial line, and the flap be then irritated, it will be drawn upwards and outwards with remarkable force; this movement, it is evident, can only be effected by two muscles, the levator palati and palato-pharyngeus. These muscles, then, I consider the chief mechanical obstacles to the junction of the margins in the mesial line. Hitherto I have taken no notice of the action of

the circumflexus, or tensor palati. I am inclined to think that its action is very limited, and probably, as the dissection in my possession would indicate, is greater upon the parts outside the posterior pillar than on those contiguous to the fissure. Neither have I alluded specially to the action of the palato-glossus, because, though it might with a feeble power incline the soft palate downwards, its influence, as regards the practical view I am now taking, is completely counteracted by the more powerful muscles connected with the palate above."

There can be no doubt that the plan suggested in the concluding portion of this paper by Sir William Fergusson, of dividing the levator palati, palato-pharyngeus, and palato-glossus muscles, is by far the most scientific and certain way of proceeding in order to get an easy approximation of the margins of the cleft; and in the recent lectures on the "Progress of Anatomy and Surgery during the Present Century," delivered at the Royal College of Surgeons, the number of cases (between 300 and 400) which that gentleman has treated, clearly show the soundness of the views which he put forward in 1844.

There seems, however, one important point that has been almost entirely overlooked, that is, the deformity which invariably exists above

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pharynx.

* Passévant rei
the cleft had been
improve the voice;
all general.

W.West, Del.

SPLIT PALATE OF CHILD TWO WEEKS AFTER BIRTH.

TAKEN FROM A PRE-ANATOMIC IN THE MUSEUM OF [illegible] POSSESSION

and behind the soft palate, in consequence of which the upper part of the pharynx entirely loses its dome-like form, the ends of the turbinated bones being exposed to view, and the posterior openings to the nares absent.*

When, therefore, the palate which has been subjected to a surgical operation is brought into play, the parts would seem to be perfect, and much dissatisfaction is felt at the disagreeable tone of the voice, often forming a matter of surprise both to patient and operator. There can be little question that in very many of these cases this has arisen from the free communication that exists between the upper part of the pharynx and the cavity of the nose, even when they are separated from the mouth partially or completely by the now perfect velum palati.

All the skill of the surgeon would, we fear, fail to restore the posterior nares to their natural condition, and yet it is tolerably clear that we cannot expect to get a natural tone of voice, accompanied by intelligible articulation, unless something can be done either surgically or mechanically to represent the parts that have been undeveloped in the cavity of the nose and pharynx.

* Passévant relates a case in which he attached the uvula (after the cleft had been closed) to the back of the pharynx, in order to improve the voice; but the practice does not seem to have become at all general.

RT I
OSSESSION

W.West lith

CLEFT PALATE OF CHILD SIX WEEKS AFTER BIRTH.
TAKEN FROM A PREPARATION IN THE AUTHOR'S POSSESSION.

When the cleft extends into the hard palate to any extent, the septum of the interior of the nose will be found incomplete, as in fig. 19.

Where the cleft is unsymmetrical, the margin of the gap in the anterior portion will be seen articulating with the vomer very often. Since the propagation of clear and agreeable sound is dependent to such a degree for its modification on the shape of the passage through which it travels, the importance of considering the nasal region in the treatment of congenital cleft palate cannot be overlooked.

Nature has to some extent endeavoured to remedy the defect in this region, by the growth of what appear to be nasal polypi. In eighteen cases that I have examined recently, I have found them present, and in no case absent. They may be attached to the anterior portion of the nares, or to the back of the pharynx, or between one or other of the spongy bones—they are usually found in pairs, though sometimes singly—when situated on one side only, it is generally in cases of complete fissure of the hard and soft palate together with the alveolar ridge, and is then occasionally of a cystic character.

In the infant six months after birth, I have found thickening of the mucous membrane (in making a post-mortem,) at the point where they are most frequently attached, usually near the apex of the

cleft. In a case seven years of age, they are well defined; in a case seventeen years of age, they are so large as to completely block up the cleft, and render the patient's speech quite intelligible, and in a patient sixty-eight years of age, they are small, symmetrical, and of a denser consistence than in the younger cases. I have carefully prepared drawings of the cases I have mentioned above, the same size as they appear in nature. They cannot always be seen without the aid of a mirror, and are very likely to be confounded with the spongy bones, until a good many observations have been made and the finger educated to diagnose their character.

I am not aware that these growths have ever been described before in special connection with congenital cleft palate, nor would it be at all wise for me to say that they are present in even the majority of cases, still less in all; but the fact of my finding them in every case that I have had the opportunity of seeing recently, is I think, sufficient to justify me in making the matter known, in order to obtain the result of larger observations from others.

I cannot but think, that their presence has in many cases been the cause of success in the operation of Staphyloraphy, although the surgeon may have taken no note of them.

I think they are somewhat different in character

from the bodies frequently found in the naso-pharyngeal cavity, and described by Kölliker, in his manual on Microscopic Anatomy, but they are very likely to be confounded with them.

Besides that condition of the mouth, known as congenital cleft palate, we frequently find patients with what is known as a "high roof" to the mouth; in many cases this phrase really describes the deformity correctly, but not always; for occasionally the height of the palate is not greater than it should be, but appears to be higher from the lateral compression of the alveolar processes, and the anterior third of the palatine portion of the Maxillæ.

The mouth, under these circumstances, assumes the form shown in the annexed woodcut, taken

from the cast of a lad under my care for treatment.

The inconvenience arising from this condition is obvious. The letters are all pronounced thick, as by a patient with enlarged tonsils, and some words, such as cat and caper, are given as tat and taper. From the observations of Dr. Langdon Down, it appears there are a large number of cases of this description among idiots, and persons of feeble intellect; that gentleman has also noticed the curious fact, that it is frequently associated with a division of the spinal column in the sacral region.

Another deformity of the palate likely to be confounded with the last, but totally distinct from it as to origin and result, is that to which Dr. Ballard has paid so much attention, with a view to ascertain its cause and effects.

The palate is increased in length, and thus to the unpractised eye conveys the idea of narrowness shown in the last engraving.

The length is caused by the protrusion of the incisor teeth, and the alveolar process in which they are inserted.

This condition is produced by constantly sucking the thumb during infancy and childhood.

The result is a most unsightly appearance from the prominence of the upper teeth, and the lip being curled up.

Dr. Ballard believes the habit by which this deformitory is produced to be a fruitful source of cerebral disease: this is not a matter, however, for me to enter further into.

With the speech it induces a lisp, that unless it be in fashion, is a great annoyance. With the normal action of lacerating the food which the upper incisors should possess, it interferes, by taking them out of the reach of their antagonists in the lower jaw, but the principal reason that brings them under the notice of the Dentist is the unpleasant appearance it gives to the face.

The treatment for its remedy will be found described further on.

EXPLANATION OF PLATE.

Showing growths found in the naso-pharyngeal cavities of patients suffering from Congenital Cleft of the Palate.

Fig. 1. W. B., Aet. 68. Unsymmetrical Cleft, associated with hare-lip. Two small bodies, dense in structure, attached to the vomer.

Fig. 2. J. H., Aet. 16. Complete fissure with double hare-lip, (treated soon after birth). Two larger bodies attached to turbinated bones, and less dense in structure than Case 1.

Fig. 3. E. T., Aet. 17. Cleft of soft palate and portion of hard palate. Two large growths attached to upper part of vomer, and completely blocking up the cleft so as to render the voice quite intelligible.

Fig. 4. J. A., Aet. 19. Complete fissure of palate with double hare-lip. In this case the growth was of a cystic character, and on one side only, being attached to turbinated bone, and shrivelled up after it was freely opened with "London Paste."

Fig. 5. E. A., Aet. 7. Growths in the case of a little girl, placed anteriorly in the nose, so as only to be seen by the aid of the Rhinoscope.

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CHAPTER III.

ON THE TROUBLES ARISING FROM CONGENITAL CLEFT OF THE PALATE. DIFFICULTY OF SUCKLING DURING INFANCY. RETARDED DEVELOPMENT OF THE BODY FROM INSUFFIENCY OF NUTRIMENT. DEFECTIVE SPEECH. INFLAMED STATE OF NARES AND FAUCES, ETC.

When a child is born with hare-lip, the attention of the medical practitioner or nurse will be at once attracted, and an examination made of the mouth to ascertain whether it is complicated with cleft palate. If, however, there is no deformity of the lips, the simple cleft may not be observed until the child begins suckling; if it is small, and confined to bifurcation of the uvula, this will not cause much trouble; but should it extend through the soft palate into the hard, the milk will be found oozing from the nose instead of passing from the mouth into the stomach in the normal manner.

Under these circumstances, the child will have to depend for its support upon the nourishment that can be administered to it by means of a spoon or feeding-bottle. The latter is the better course of the two undoubtedly, and the little

patient may be very much helped in the process of receiving its food by means of the artificial nipple and tubing attached to Maw's very simple but efficient feeder, if a contrivance shown in the accompanying woodcut be attached to the neck of the mouthpiece.

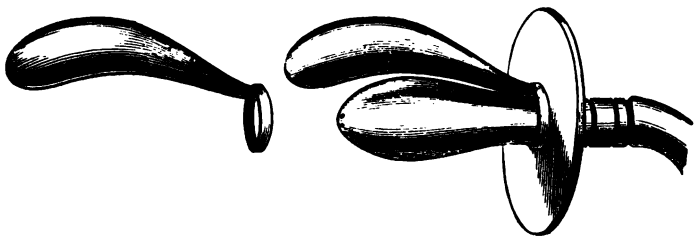

FIG. 4. The palate-piece alone and FIG. 5. attached to the ordinary nipple sold with Maw's infant-feeder.

This consists simply of a flap of elastic india-rubber made to fit into the roof of the mouth. The pressure of the nipple against its surface when in position will thus convert it into an artificial palate-piece, and prevent the escape of the milk into the nose in the effort of swallowing. It was suggested some years back in an article by Mr. G. Williams, in the *Dental Review*, that a flap of thin sheet elastic, not modelled to the arch of the palate, but simply cut out and sewn on to the feeder should be used; when it is not convenient to obtain such a one as I have just described this is a very good expedient, but if it is possible

to procure a properly-fashioned arrangement, it is evident the discomfort and anxiety that must arise will be very much lessened.

Sponge or leather* is sometimes used for this purpose, but is on many accounts very objectionable, from becoming sour and offensive after use, while the vulcanized rubber can be kept perfectly sweet and wholesome by means of washing in warm water.

I have sometimes found, however, the child so exceedingly delicate, that but little chance existed of saving the infant's life unless it could be supplied with nourishment from the mother's breast; I have therefore prepared an artificial palate, attached to a shield to go over the breast, and so enable the little one to take its natural nourishment. Being made of thin elastic rubber it is not uncomfortable, and can be kept perfectly clean, while from the form it is made in it can be used for either breast. It is shown in position in the accompaning woodcut, Fig. 6.

Under the most favourable circumstances, and when the greatest possible care is exercised, there is little doubt that the growth and development of the child is very much retarded, though its constitution may not ultimately suffer in consequence of the defective palate, beyond that delicacy of frame which is very often the accom-

* Snell, on "Artificial Palates." 1828.

paniment of extreme parental anxiety and watchfulness.

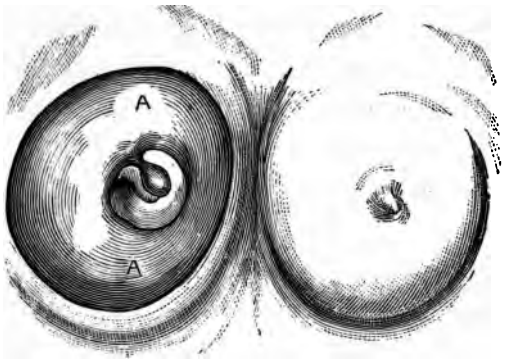

Fig. 6.

The time for operating upon the hare-lip will have to depend upon the state of health of the babe, and may take place a few hours or several months after birth, according to circumstances. This is a matter exclusively in the hands of the surgeon, and quite beyond my province to enter into, except in reference to one or two points which, with all deference, I would submit to the consideration of those gentlemen who are in the habit of performing the operation.

When the division in the lip is bilateral, and the intermaxillary portion of the jaw very prominent apparently, it is usual in a large number of cases to remove the protuberance altogether, using the middle portion of the lip for the columnæ nasi, and then, having pared the edges

of the side flaps, to bring them together in the median line.

The result of this treatment in after-life is to give to the upper lip an exceedingly flat unsightly appearance, and to the lower lip a relaxed and pouting expression as shown in Fig. 7.

Fig. 7.

If the patient's face be looked at from the side, the contour of the countenance would seem to indicate that only a portion and not the whole of the intermaxillary process should have been removed, since its apparent prominence was undoubtedly due principally to the great want of substance on each side, and not alone to an excessive development in the median portion. In Sir William Fergusson's recent work "On the Progress of Anatomy and Surgery during the last

Century," this is suggested as a reason, and drawings given of a case, by which it is proved how little deformity need occur when the patient is in the hands of a skilful operator. In the same chapter it is also pointed out that the notch in the lip, so often observed in after-life, is mainly owing to the edges of the divided lip not being cut away to a sufficient extent, so as to bring the skin and mucous membrane into proper contact with each other. I shall have occasion to remark in the sixth chapter of this volume on the trouble arising from the neglect of this apparently trivial matter. During infancy but little difference is observable in the tone of the babe's cry, but when the time arrives at which the child should, under ordinary circumstances, begin to give utterance to "articulate" sounds, it becomes apparent how great a change the deformity gives rise to in the speech.

In many cases no amount of attention, except a mother's instinct, will be able to understand what the child attempts to express; and this, strange to say, is not regulated, as might be expected, by the extent of the cleft, but is almost as bad in simple division of the soft palate as in those cases where there is also division of the hard palate and alveolus.

From birth up to seven or eight years of age the cleft increases both in width and length, in

proportion to the rest of the mouth, unless, in the case of hare-lip being associated with it, there are mechanical means used to compress the parts laterally, by the use of a truss, such as we find described in the work by Sir William Fergusson already referred to. The gap may then be reduced so that at the anterior part, the two sides of the divided alveolus will become so closely approximated as to appear continuous. After the age I have mentioned I am led to the conclusion, so far as my own opportunities of observation have gone, that the cleft simply increases in length, the width being, in the majority of cases, the same at twenty-one years of age as at the earlier period.

From seven to ten years of age the patient will become first conscious and sensitive of his or her defective speech. At this age, too, nourishing food properly masticated is of great importance. Both these circumstances, therefore, would seem to point to it as the best time for the insertion of an artificial velum, unless the operation of staphyloraphy has been performed during infancy;* for it will be well-nigh impossible in a case of cleft in the hard and soft palate to apply the food with the tongue to the roof of the mouth in such a

* It should be remembered, however, that this operation has been so recently introduced that we have no means of judging what its effect will be when the patient arrives at adult years.

way as to ascertain when it is ready for swallowing. The consequence will therefore be that a considerable quantity of that which should yield the most nutriment is received into the stomach in such a state as to impair the digestive organs. There is also the liability during childhood of the cleft getting filled up with the solid food, and in some cases causing suffocation.

The difficulty of controlling the passage of air through the nares by means of the velum palati in nearly all cases gives rise to a most pernicious habit of checking it by means of a contraction of the alæ of the nose through the influence of the compressor naris muscles; thus to a certain degree rendering the utterance more distinct, though it gives a very disagreeable "nasal twang." It is wonderful to what an extent these muscles come under the patient's control. In the French language this would be of no consequence; in the Anglo-Saxon tongue, however, it is a considerable annoyance, and most difficult, when firmly established, to overcome. Still, if an artificial palate be inserted at the time I have indicated, it may be prevented or checked to a very great extent, until the habit is entirely forgotten or overcome by the patient finding it is unnecessary to control the passage of air through the nostrils, except by the means now provided in the elastic velum.

From the great exposure of the nares and fauces to the air in large perforations or clefts of the palate, these parts are exceedingly liable to inflammation and ulceration extending downwards, and during the winter months causing frequent sore-throats and deafness, as well as loss of voice. Considerable irritation arises in the cavity of the nose from the mucus drying on the turbinated bones and margins of the opening, in consequence of the too free access of air to these parts. All of these symptoms, however, disappear when the cause is removed, either by operation or mechanical treatment, though the latter, by checking to a greater extent the passage through the nares, is probably the more efficient of the two for this purpose.

CHAPTER IV.

SOME ACCOUNT OF THE APPLIANCES USED FOR REMEDYING CLEFT PALATE (WHETHER CONGENITAL OR ACCIDENTAL) FROM A.D. 1552 TO THE PRESENT TIME.

An account of the progressive stages by which we have arrived at the present comparative perfection of artificial palates may not be uninteresting to my readers, or out of place in a work of the present kind.

My principal authority on this subject is Snell, who took great pains to collect all that it was possible to glean as to the contrivances used by our forefathers for remedying this deformity.

Little is known or said on the matter till the fifteenth century, though Isaac Guillemeau, in his work published in 1649, mentions the name by which the Greeks called the appliances for filling up the cleft; thus leading us to infer that they were acquainted with some method of treatment for perforation or cleft of the palate.

In order that we may more easily see the time that was occupied in passing, stage by stage, from one improvement to another, I propose to arrange the names of those surgeons, dentists,

and others who have paid any attention to this matter, in chronological order.

1552.—Hollerius, in his "Observ. ad Calcem de Morbis Internis," proproses to stop the apertures with wax or sponge.

1565.—Alexander Petronius, in his "De Margo Gallico," proposes, when there is but one opening in the palate, to stop it with wax, cotton, or a gold plate, taking care to give to the instruments the same concave form as the roof of the mouth. Though this is the first mention of a gold plate being used for this purpose, still, from the fact of Petronius not being more explicit as to its mode of fitting and retention in the mouth, we are, as Snell very justly observes, led to the conclusion that the remedy was one with which his readers were not altogether unacquainted; and we must not therefore give Petronius the credit of being the inventor of this mode of treatment.

1579.—Ambrose Paré, in his book on surgery, published in Paris, and in the year 1649 translated into English by Thomas Johnson, proposes that the cavity should be covered over by a gold or silver plate "made like unto a dish in figure, and on the upper side, which shall be towards the brain, a little sponge must be fastened, which when it is moistened with the moisture distilling from the brain will become swollen and puffed, so that it will fill the concavity of the palate, that the

artificial palate cannot fall down, but stand fast and firm as if it stood of itself."

1649.—Isaac Guillemeau, in his "De Ouvres," gave a drawing of an instrument similar in form to Ambrose Paré's instrument; but suggested that, as it was not always possible to adapt the plate perfectly to the roof of the mouth, a lining of sponge or lint should be applied, in order to render the closure more complete.

1653.—Amatus Lusitanus, in his "Curat. Medic. Centur.," mentions a boy with diseased cranium and perforated palate, whose voice was restored by means of the gold plate and sponge.

1685.—Nic. Tulpius, in his "Observat. Medici," mentions the same mode of treatment.

1715.—Garangeot, in his "Treatise on Instruments," is the first that we find making any step in advance of his predecessors with regard to the construction of obturators. Describing one, he says:—"This instrument has a stem in the form of a screw, upon which runs a nut. To make use of it, take a piece of sponge, cut in the shape of a hemisphere, with a flat surface; pass the stem of the obturateur through the sponge, and fix it by means of the nut. Dip the sponge in water, squeeze it dry, and introduce it through the aperture."

1723.—Fabricii Hieronimi, in his "Chirurgicis

Operationibus," recommends sponge, lint, or silver plate; not suggesting any new form of instrument. He is the first, so far, that is, as I have been able to examine these old works, who makes specific mention of congenital cleft palate in contradistinction to accidental cleft or perforation.

1734.—R. Wiseman, Sergeant-Surgeon to King Charles II., in his Chirurgical Treatises gives evidence of having bestowed much thought upon the treatment of the defects of the palate, though he cannot be said to have made much real and practical progress. His novelty in treatment consisted in filling up the cleft with a paste composed of myrrh, sandarac, and a number of other ingredients. His idea was certainly in advance of his time; for by this means a most important end was gained,—that of perfect exclusion of air by its complete adaptation to the margins of the cleft. We are unfortunately not informed how this "paste palate" was kept in position.

1739.—Heister, in his "Institutions of Surgery," suggests the use of "a gold or silver plate adapted to the perforation, and furnished with a handle or small tube, which, being armed at the top with a sponge, he may thereby exactly close the perforation."

1754.—Astruc, in his "Treatise on Syphilis,"

makes the first mention that we have of a silver button to the metallic obturator, in place of the sponge, in order to avoid the unpleasantness arising from the absorption of mucus.

1786.—M. Pierre Fouchard, in his "Chirurgeon Dentiste," gives an account of some instruments which show a very great improvement on the forms previously in use; the sponge, as a means of support to the obturator, being substituted by an arrangement of metallic wings, worked into proper position after introduction into the cleft, by means of a hollow stem and nut, which, when screwed down, kept the wings (covered with soft sponge) across the aperture.

There are descriptions given of others on the same principle, and of one on a then new plan, depending for its support upon ligatures round the canine teeth.

It will thus be seen that more than two hundred years had elapsed before any decided improvement took place in this department of dental science. MM. Dubois Foucou, Touchard, Bourdet, Cullerier, and De Chamont give descriptions of a variety of obturators, all more or less resembling the instrument of Fouchard, with its arrangement of wings, clasps, and screw-nuts.

1820.—The next advance made was by M. De

la Barre, who is the first to mention the use of "elastic gum" in the restoration of the velum and uvula. The artificial palates designed by this gentleman were ingenious in the extreme, but of such a complicated nature that none but a man of considerable mechanical genius could ever hope to be successful in their application. Still we must bear in mind the great step taken towards the present instruments in use by the introduction of "elastic gum."

1828—I now come to a consideration of the artificial palates constructed by Mr. Snell, who arrived at much more satisfactory results in his method of treatment than his predecessors could have done, from the fact that he first obtained an accurate model of the mouth, on which he mounted and fitted his obturator—a point that up to this time is not mentioned, even if it was practised.

He says in his book that, with the exception of one method proposed by Mr. Alcock, in the *Medical Intelligencer*, he is not aware of any successful mode of treatment for remedying congenital cleft of the palate excepting his own plan, which he goes on in the next pages to describe in the following words:—"My method of constructing an obturator is, with a gold plate, accurately fitted to the roof of the mouth, extending backward to the os palati, or extremity of the hard palate, a part of the plate, about

an inch in length, being carried through the fissure. To that part of the plate which answers to the nasal fossæ are soldered two plates, meeting in the centre and carried upwards through the fissure to the top of the remaining portion of the vomer, to which it should be exactly adapted, and made to the natural shape of the nasal palatine floor: thus the fluid of the nose will be carried directly backward into the fauces. A piece of prepared elastic gum is next attached to the posterior part of the plate, where the natural soft palate commences, extending downward on each side as low as the remaining part of the uvula, and grooved at its lateral edges to receive the fissured portions of the velum. A movable velum is placed in the posterior centre of the elastic gum. That these may partake of the natural movements of the parts during deglutition, a spring is affixed behind them, one end of which is fastened to the posterior and anterior surfaces of the principal plate, and the other end rests gently against the posterior face of the india-rubber; this keeps it always in close apposition with the edges of the fissure during deglutition.

"It is requisite here to mention that the elastic gum should be placed in a gold frame, and not merely fastened to the posterior part of the plate, as it would shrink up by remaining in the mouth.

This frame should pass round its edges only, leaving the centre open. The anterior lateral edges should be made to come considerably over the sides of the fissure, which will prevent their slipping behind it during their altered positions; the whole apparatus being held up by elastic gold springs round the teeth on each side."

1845.—Mr. Stearn, a surgeon of London, in this year communicated four articles to the *Lancet* on congenital deficiency of the palate, when he gave a description of an instrument which he had contrived for the treatment of these cases; it was in some respects like the obturators of De la Barre and Snell, though more difficult to construct than either of them.

From a description of one constructed by the Drs. Tucker, of Boston, drawings of which I have reproduced from the eighth edition of "Harris's Dental Surgery," I am enabled to bring before my readers an accurate idea of the nature of this very interesting instrument.

It consisted of a gold plate, fitted across the hard palate, having attached to it, by means of two spiral springs, an artificial velum of elastic rubber, consisting of a body, wings, and grooved edges to receive the margins of the cleft.

"Fig. 8 shows the lower surface of the palate-plate and anterior surface of the velum; *a*, the palatine plate; *b*, the flat spiral springs, extending

from the posterior margin of the plate to the upper part of the velum; *c c*, wings of the velum; *d d*, the flange; *e*, the central portion.

"Fig. 9 shows the upper surface of the palate-plate, and the posterior surface of the velum and spiral springs; *a*, the palate-plate; *b*, the spiral springs; *c c*, wings of the velum closed; *d d*, the

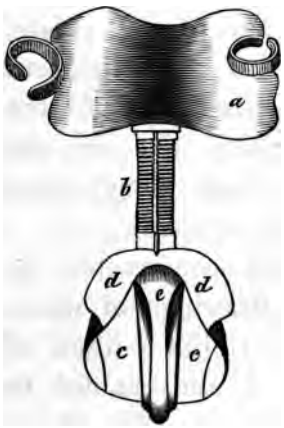

Fig. 8.

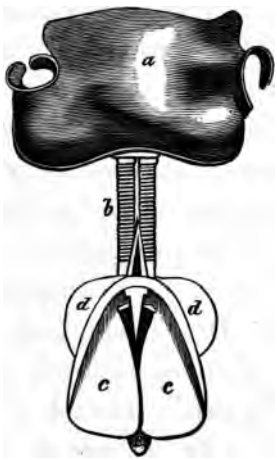

Fig. 9.

flange, as seen above the wings; and *e*, the central portion below the wings, and intended to represent the uvula.

"Fig. 10 represents the velum with its wings separate from the plate, showing the central portion, before being attached to the hook, at the lower extremity of the flattened spiral springs.

"In fig. 11 is represented a side view of the velum, showing the groove between the flange and the wings, for the reception of the fleshy sides of the fissure."

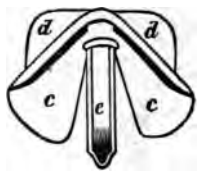

FIG. 10.

FIG. 11.

1857.—Mr. Sercombe, who had for some time paid a great deal of attention to the treatment of cleft palate, in this year gave a description of the instrument he uses in remedying this defect, in a paper which he read before the Odontological Society, entitled "Cleft Palate, its Surgical and Mechanical Treatment."

From that paper we extract the following account of the instrument, with a drawing of one that had been successfully applied to a case, and worn for two years.

Mr. Sercombe says,—"My velum is made of two pieces of vulcanized india-rubber, the larger piece extremely thin, the smaller piece much thicker; the shape of both is represented in

fig. 12. The dotted line shows where they are attached by sewing to the posterior margin of

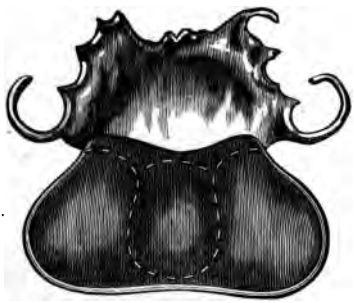

Fig. 12.

the gold plate, which has a single line of holes punched in it for this purpose. The exact size of the larger piece will vary in each case. . . . This piece should also be extremely thin, to adapt itself to the ever-varying sides of the fissure; but a piece of such tenuity as to secure this vital point, weighted with mucus, would quickly droop, but for the support which is given to it by the smaller and stouter piece which lies immediately underneath it.

"These two pieces of sheet rubber sewn to the posterior margin of the gold plate—the thinner to its upper surface, and the thicker to its lower—have been found, in more than one instance, to restore to the person using them a distinct articulation."

It will be seen from the drawing (fig. 12) that this obturator is held in position by bands passing round the molar and bicuspid teeth.

In 1862 Mr. Williams exhibited the following case, showing his mode of treatment:—

Fig. 13.

Case of complete fissure of the hard and soft palate, the fissure extending through the whole of the hard palate and uvula.

Fig. 14 represents Mr. Williams' improved obturator for the above case. The portion A, which covers the hard palate, is constructed of hard vulcanite. The velum, or soft palate, *b*, *b*, *b*, is formed of soft vulcanite; the two portions being united by a narrow band of elastic gold, which allows the

artificial velum to follow the muscular action of the palate.

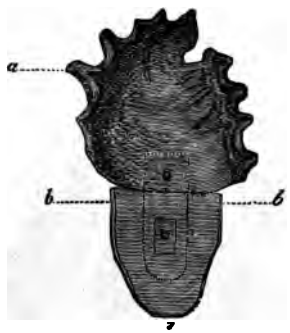

FIG. 14.

1864.—In this year Dr. Norman Kingsley, of New York, brought before the Odontological Society of Great Britain a method of treatment that for its merit demands the highest praise. The instrument itself was not altogether new in form, being to some extent very similar to that which had been constructed some years before by Mr. Stearn.

The interest attaching to the paper was rather the account of the *modus operandi*, which was briefly mentioned, the two great novelties in Dr. Kingsley's treatment consisting in taking an impression of the parts in plaster of Paris instead of wax, and preparing the elastic rubber vela in

metallic moulds, rendering duplication of them a very easy matter.

The instrument, and a description of its various parts, are shown below.

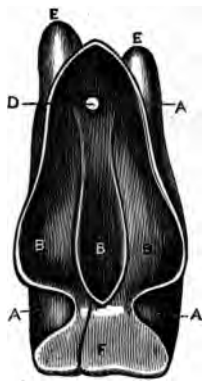

FIG. 15.

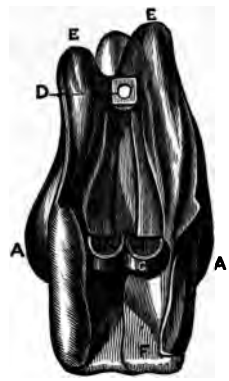

FIG. 16.

Fig. 15 represents the lower, and fig. 16 the upper part of an artificial velum. A, indicates the groove in which the sides of the cleft repose; F, the posterior end, which may come in contact with the wall of the pharynx. The surface, B, lies next the tongue. G, springs of the same material, which assist it to keep its form and place. The points E rest on the top of the bone at the apex of the fissure. D, the hole through which the attachment is made, to keep it from running back.

1865.—Mr. Robert Ramsay brought an instru-

ment before the above-mentioned society, made on Dr. Kingsley's principle, but much simplified in construction, in a paper on the "Treatment of Congenital Cleft Palate."

1867.—Mr. George Parkinson, in a communication to the *Lancet*, makes the following remarks on his method of treating cleft of the hard and soft palate.

(I have reproduced the drawings by which his article was illustrated, in order to render it the more interesting.)

"In a case of congenital fissure of the palate extending through the hard tissues and alveolar ridge, after having taken a correct model of the parts in wax or plaster of Paris, I commence by fitting a thin plate of gold over the vault of the palate, as far back as the posterior margin of the

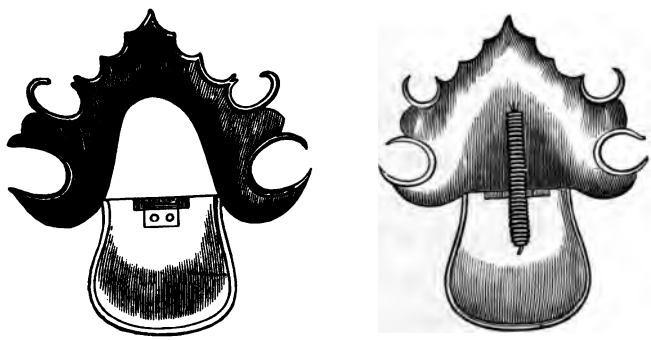

FIG. 17.

Palatine surface. Nasal surface.

palate bone would have extended had the bony arch been perfect. To the posterior margin of this plate, by means of a hinge, is attached a velum, constructed of hard, well-polished vulcanized india-rubber, formed in such a manner as to fit the palatine surface of the remnants of the soft palate, and allow them to glide over it in the act of deglutition. To keep the velum in its place, one end of a delicate gold spiral spring is made fast to it, the other end being fixed on the nasal surface of the gold plate representing the hard palate. This spring must be so adjusted as just to keep the india-rubber velum in contact with the soft parts, and allow the portions of uvula on either side to approximate in the act of deglutition."

FIG. 18.

Fig. 18 represents an obturator made by Dr.

Suersen, of Hamburg, entirely of hard rubber. A gold medal was presented to this gentleman, on account of his invention, by the Central Association of German Dentists.

It is impossible to mention all those gentlemen who, of late years especially, have treated by one means or another the defects of the organs of speech and deglutition, I can only name some of them; and trust, at a future time, to have the means of presenting my readers with an account of the special modes of treatment adopted by Dr. Bogue, of New York; MM. Rottenstein and Préterre, of Paris; Mr. Charles James Fox, and Mr. Vasey, with others, of London.

I have endeavoured, briefly it is true, to trace, from the first accounts given, the successive stages by which we have arrived at the present mode of treatment, showing the development of the principle that the obturator should not simply fill up the gap in a cleft palate, but be so constructed as to work on physiological principles with the natural movements of the sides of the cleft.

In 1844 Sir William Fergusson demonstrated the precise action of the muscles of the split palate; and in 1845 Mr. Stearn gave to the profession an account of an instrument which, from the movements it was capable of, I am led to conclude was constructed with a view to

utilize the peculiar muscular action which the year before had been shown to exist by the first-mentioned gentleman.

This may have been simply accidental, but it is worthy of note.

In Dr. Kingsley's appliance the matter was more fully developed; but this instrument, like Stearn's, had the fault of being too complicated for general use. I now come to the consideration of my own principle of treatment. In the main it is based on the inventions of Dr. Kingsley, though considerably modified, as will be seen in the next chapter, on "The Mode of Preparing an Artificial Velum." It is impossible for me to give one form of instrument in particular, and say that is the special pattern that I use. I endeavour in every instance to produce an obturator that will best meet the necessities of the case, not confining myself to one set rule, always bearing in mind, however, the important point of supplying the congenital cleft with an instrument that shall depend for its support upon the overlaps to the margins of the cleft, and not upon the teeth, having in recollection the injury that I have seen follow the attachment of any bands or wire to those very important organs of speech and mastication. This I consider a point of the greatest consequence, and one which cannot receive too

much care and attention in the treatment of cleft palate by any form of obturator.

I have recently, and with most satisfactory results, attempted the imitation in the elastic velum of all the parts that nature has left undeveloped, and the following woodcut (fig. 19)

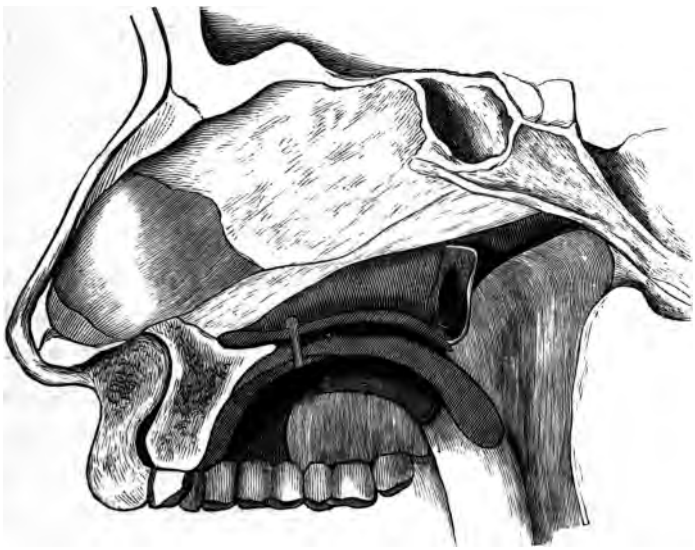

Fig. 19.

shows in section a case which is described further on, in which will be seen the nasal septum, posterior opening to the nares, with the velum and uvula reproduced in this manner.

In the seventh chapter, containing an account of the treatment of cases, are given the further variety of forms that I use under different circumstances.

CHAPTER V.

ON TAKING THE IMPRESSION FOR AN ARTIFICIAL PALATE. MAKING THE PLASTER AND METALLIC MOULDS. VULCANIZING. VULCANITE. FRONT PIECE, ETC.

It will be readily understood that in an appliance such as I have described, successful results in a great measure depend on the accuracy of the impression from which the model is made. I therefore crave the patience of my reader if I bestow what may seem at first sight an unnecessary amount of description to this part of the operation.

The materials generally used for taking impressions of the mouth are wax or some other plastic preparation, such as gutta-percha or Stent's composition; but I think it will be admitted that these substances are by no means satisfactory, especially in taking impressions of parts that are so easily displaced as the soft palate, for none of them can be used, under the most favourable circumstances, without applying pressure sufficient to render the impression and model incorrect.

It being, then, necessary to introduce some preparation into the mouth in such a state that it

will not move the most delicate fold of mucous membrane, while in a short time it shall become so hard as to admit of removal without any alteration of form, I invariably use plaster of Paris, and so satisfied am I with the results obtained, that for even small cases of artificial teeth in the upper jaw I prefer it very much to wax or Stent's. Still, for the lower jaw, having on many occasions carefully tested it, I cannot recommend its use. In most cases the soft palate will be found too sensitive at first to admit of a full impression being taken at once, or even of the holding of the impression plate in position sufficiently long to admit of a model being taken. Two courses are open to the operator to overcome this difficulty: one is, to take an impression first of only the front of the mouth and cleft, and then on successive occasions gradually extend it backwards, till at last you are enabled to get a good impression of the whole of the parts, extending outwards to the alveolar ridge, upwards to the remains of the vomer, and backwards to the posterior wall of the pharynx and pillars of the fauces. Another method is to paint the parts with a solution of bromide of ammonium or tannin and glycerine, ʒi. to ʒiv. applied with a camel's-hair brush—of the form shown in fig. 20.* the brush acting almost as beneficially as the preparation used.

* Made by Mayer and Metzler, of Great Portland Street.

One or other of these two plans must be adopted before any hope can be entertained of getting a good impression. When the parts are

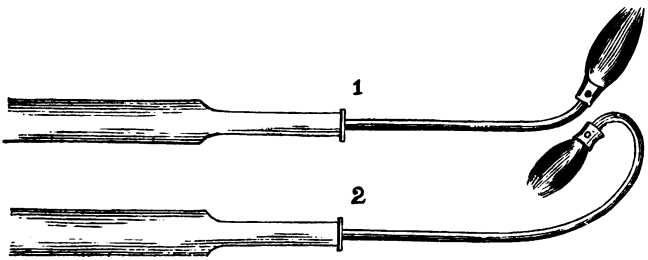

Fig. 20.

rendered sufficiently insensible to the presence of a foreign body, an impression-tray must be carefully prepared, so as to fit in front closely to the teeth, and at the back part leave a space about the eighth of an inch in extent from its surface to the corresponding surface of the soft palate. This does away with the necessity of an excess of plaster, and the consequent risk of any portion falling into the throat or upon the base of the tongue, and thus produce such irritation that the utmost self-control on the part of the patient will scarcely be able to overcome it.

In a paper read before the Odontological Society by Mr. Ramsay, on the 1st of May, 1865, an impression cup, made expressly for each case of hard vulcanite, was recommended. I have however

found that a much better plan is to use a tray of the form of a common spoon, that I have had made for me by the Messrs. Ash and Sons, of Broad Street. These being of pewter, can be bent about to the desired form and then covered with sheet gutta percha, which is placed on the tray and put into the mouth while warm. In this manner you get the outline of the teeth, which will act as a guide in introducing the tray with the plaster on it.

It occasionally happens that the opening of the mouth is very much contracted, either from the effect of old cicatrices or gun shot wounds. This contraction may render it impossible to get a complete impression of the palate out of the mouth at one time.

To overcome this difficulty I have had a tray made of the form shown in Fig. 21, still in the

Fig. 21.

shape of a spoon, but in two pieces, the handle of each over-lapping the other; so that when the handles are brought into proper contact you may

be quite sure that the two halves inside the mouth are in proper relative position to each other also.

The use of this sort of impression plate requires a little patience and skill to manage nicely, but there is no more difficulty than any one with ordinary tact will be able to overcome.

It may be used either with or without gutta percha on its surface. If gutta percha be used, care must be taken to roughen it, in order to give attachment to the plaster of Paris. If this be neglected, the liability is incurred of leaving the plaster in the mouth, and bringing the tray away alone.

The one half of the tray is thus covered with a sufficient quantity of plaster, according to the case under treatment, and placed carefully on one side of the mouth, in such a position as to get a fair half of the impression, the right half of the spoon, of course, being used for the right side of the mouth. When the plaster is well set, it is carefully removed from the mouth, and the side which, with its fellow, is to form the medium line of contact, pared down quite smooth, and flush with the edge of the spoon. The second half of the tray is then placed in its proper position with its fellow, to see that no overhanging portion of plaster is present before putting them into the mouth.

All the surface of the half impression already

obtained is then soaped thoroughly with brown Windsor soap, by means of a camel's hair brush, moistened either with water or sweet oil. When this is ready, fresh plaster is mixed in the manner hereafter described, and the impression already obtained is then placed again in the mouth in the exact position it first occupied, and held firmly in place by an assistant, or the patient, if he has sufficient intelligence and nerve to be trusted. The second half is now covered with a sufficient quantity of plaster, and introduced into the mouth, so as to obtain an impression of the parts left exposed, after the first impression is in position. The guide, as to the situation of the moist plaster in the mouth, is given to the operator by means of the perfect apposition of the two handles, which should have all their edges flush with each other.

At the time of placing the second impression in the mouth, the head should be thrown forwards, and to one side, that is, to the right, supposing the impression has been obtained of the right side first. This will have the effect of bringing plenty of plaster into the central portion of the palate, and so produce a more accurate impression than if the head is kept perfectly straight.

When the plaster in the basin indicates that the impression is sufficiently hard to bear removal, the first half—not the last—must be detached

from its fellow in the mouth. A firm, quick pressure downwards will do this; a sufficient amount of space will then be found to remain inside the mouth to admit of its removal without suffering injury from dragging against the teeth.

By the time the first half is fairly removed, the second half will be sufficiently increased in strength to bear taking away without any chance of damage. We now have the two halves of the impression out of the mouth; and if the directions I have just given have been carefully carried out, there should be no difficulty in articulating them with each other. They will be best kept in contact by means of binding wire tied round the handles, and the two articulating surfaces being coated with liquid silex.

The perfect impression may then be cast in the usual way, or modified according to the nature of the case.

For an ordinary impression of cleft palate, where there is plenty of room to pass the plaster in and out of the mouth, the plate being prepared for use, the next step is the mixing of the plaster; and here several considerations must be taken into account—(1) the dryness of the plaster, (2) its strength, and (3) the time it takes to set, which will depend partly on its freshness, and partly on the temperature of the atmosphere, as well as the water with which it is mixed.

The best plan is to have the water with just the chill off, and then add salt in the proportion of as much as will lay upon a sixpence to half a pint of water. If you wish the plaster to set quicker than under these circumstances it would do, add to it before mixing a small portion of rouge. This will make it set so quickly, and so strongly, that increased care and watchfulness will be required with regard to the proper time for removal from the mouth. Everything being now ready, the plaster is mixed in the ordinary manner to the consistence of thick cream, care of course being taken to break up all lumps in it during mixing; a sufficient quantity is then placed in or upon the impression-plate, and the whole steadily introduced into the mouth and held firmly in its place, the precaution being adopted at the moment of putting the plate in position to incline the patient's head forward, so as not only to get a good overlap above the anterior margin of the cleft, but also to lessen the liability of any plaster running down backwards and causing retching.

Now is the time to test the patient's confidence in the operator. If there is any evidence of restlessness or nervousness, divert the attention by some remark, or by examining the plaster remaining in the bowl in order to ascertain the precise moment for removing the impression from the mouth,—by these or similar means to make the

time (which should only occupy about a minute and a half) appear less, and save any disagreeable consequences either to yourself or the subject of your operations. To those inexperienced in these matters all this instruction may appear superfluous, but its neglect will assuredly upon many occasions lead to a decidedly "embarrassing situation."

When the remains of the unused plaster in the bowl will break asunder and leave a clean, sharp fracture, then it is time to remove the impression from the mouth. If at the first it cannot be disengaged easily, then at once and without any hesitation use sufficient force to detach it, bearing in mind that at such a time every second's delay increases the difficulty. Under ordinary circumstances it will break away in the line of the cleft. This need occasion no alarm: only desire your patient to sit perfectly still and keep the mouth well open; you can then without any anxiety or hurry push the part which remains above the margin of the palate carefully backwards to the widest part of the opening, and, firmly seizing it with a pair of long tweezers (as shown in fig. 22) withdraw it.

The fractured parts, when put carefully together, will be found quite as efficient for use as if no breakage had taken place, especially if, instead of using resin and wax cement, they are united

with liquid silex, as recommended in the *British Journal of Dental Science* for June, 1868,* by which means any increase of bulk is avoided.

FIG. 22. The entire length of these Tweezers is eleven inches with the handle.†

The impression, being thus perfect, must be carefully washed over with a solution of soap (brown Windsor is the best for the purpose), and the model made in three portions, as shown in the accompanying engraving (fig. 23). We now return to the more commonplace operations of the work-room, and further minute particulars would only become tedious and unnecessary.

The model being ready for use, the artificial velum must be set up in gutta percha, having the precise shape which it will possess in its finished form. Here instruction on our part is useless, as the formation of the palate-piece will depend entirely on the characteristics of the case and the ingenuity of the operator. The gutta percha should be of the best description, and the

* "Liquid Silex." By James Oakley Coles.

† Made by Messrs. Ash and Sons, Broad Street Golden Square.

model prepared with soapstone, to prevent any adhesion to its surface. When this is worked up to a satisfactory state, the casting of the plaster moulds can be proceeded with. For an ordinary

FIG. 23.

case the best form is that shown in the engraving (fig. 24, page 72). These, however, admit of very many modifications, according to the shape of the velum, in preparation. The plaster castings, when complete, must be duplicated in type metal, the best metal obtainable and the finest casting-sand only being used. Great care must be taken

here, as any imperfection in the metallic moulds will be communicated to the surface of the rubber during vulcanizing, and can only be remedied by clipping and paring, which gives a very unsightly appearance to the finished work. When the castings are complete, and the surfaces well polished with pumice powder and water by means of a stick of dog-wood, they should fit together accurately; if they do not, there is no alternative but to commence *de novo* till you arrive at a satisfactory result.

The accompanying engraving (fig. 24) shows the castings separated, also the metallic pin fixed in the base for producing the hole in the velum by which it is attached to the hard rubber front piece. Any error with this will be found to upset the entire arrangement. The greatest care must therefore be used in getting it into a good position, according to the shape of the cleft and mouth. The moulds having been well soaped to prevent adhesion, and made warm—not hot—the next step is to pack them with elastic rubber. This is very easily accomplished: the two side-pieces, being adjusted to the base, are kept firmly in position by an iron clamp, and the rubber packed in from above. When there appears sufficient, the top is put on, and the whole screwed tightly together, being put on a hot plate for a few minutes to soften the rubber. The casts are then taken

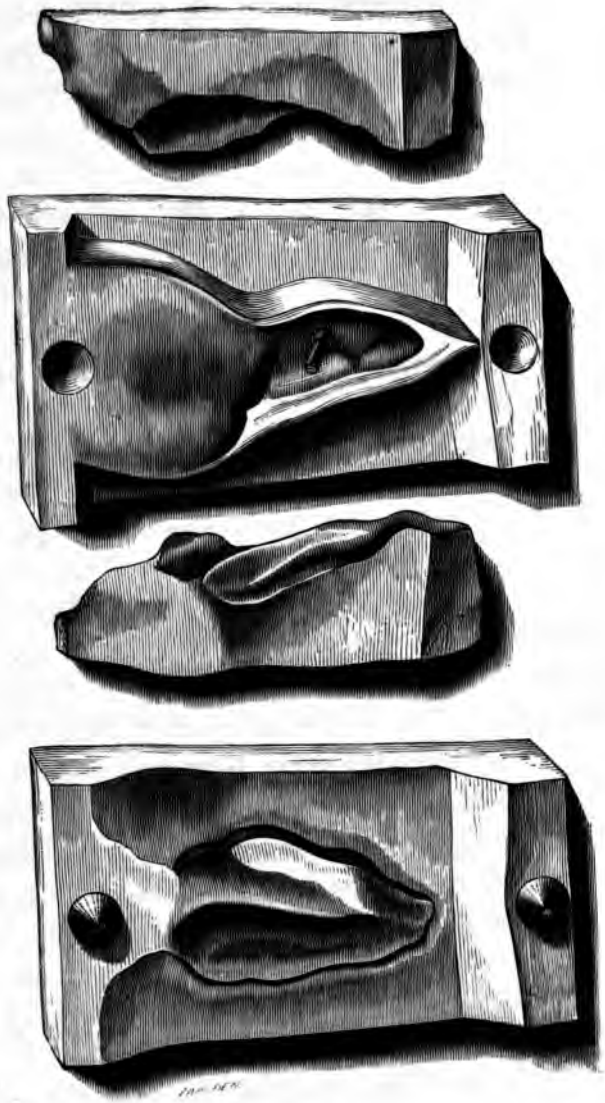

FIG. 24.

apart, any excess removed, or any deficiency filled up. They are again screwed up and fitted in an iron framework, as shown in fig. 25, with wedges

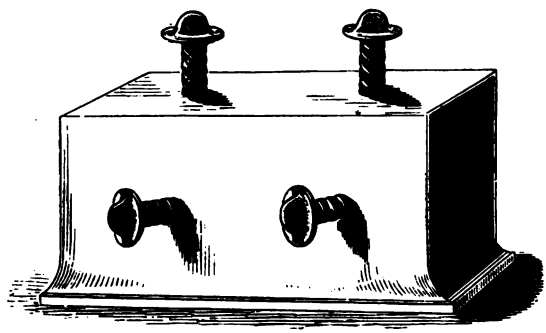

Fig. 25.

to secure them, and put into the vulcanizer. In reference to the rubber to be used, there can be no question, that which is prepared by Messrs. Ash and Sons is by far the best, both as regards quality of materials and wear.

If this description of rubber be used, the time for vulcanizing is six hours; that is to say—

2 hours at 240°.
2 hours at 250°.
2 hours at 260°.

This will produce an artificial velum of the greatest elasticity and power of resistance to the acids of the mouth. It has occasionally been a subject of inquiry as to the description of

vulcanizer I use; I have therefore obtained a drawing of one from the maker, Rutterford, of Poland Street, with a description of its different novelties. I use the largest size made, and place the mould for vulcanizing as near the centre as possible. Having tried several descriptions of boilers, I find this the most satisfactory (fig. 26).

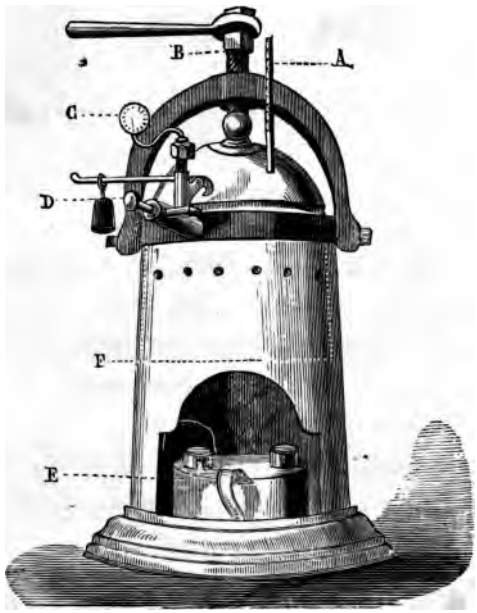

FIG. 26.

The boiler is of copper a quarter of an inch thick, and five inches in diameter. It is made for one, two, three, and four flasks, with the

ordinary rings. Each boiler is properly tested and stamped. No washer, or india-rubber ring required. One screw only (B) to tighten the lid. D is a let-off tap for steam. The safety-valve is thereby preserved, and is not liable to get out of order. The lid contains a thick lead collar, which does not require renewing. It can be used with a steam gauge (C) if preferred, or with the ordinary thermometer (A), or both. It is equally adapted for alcohol or gas.

The adjustment of a front piece to keep the velum in the cleft will depend on the state of the teeth. If they are all perfect, a simple suction-plate, as shown in Chapter VII. is all that is necessary. If any teeth should be wanting, artificial ones to supply their place should be mounted on the front piece, as in an ordinary set of teeth; and if there be any deformity of the hard palate, as in most cases there is when associated with hare-lip, it will have to be restored and made as symmetrical as possible by additions to the hard rubber. When, however, the anterior portion of the mouth is perfect, the palate should be made as thin as possible, and not extend further back than the second bicuspids.

The pin for connecting it with the elastic velum should be of soft platina wire, larger at the top so as to prevent it coming out of the hole in the artificial palate easily; that portion which goes

into the hard rubber front piece may be either notched and roughened by the file or have a small piece of plate soldered to it at a right angle, so as to hold it firmly in place.

The means by which a variety of other instruments and appliances are produced, will be found given with the cases to which they respectively refer in Chapters VII. and VIII.

CHAPTER VI.

ON THE INTRODUCTION OF THE INSTRUMENT INTO THE MOUTH. SUBSEQUENT TUITION. VALUE OF SINGING IN FACILITATING THE PROPER USE OF THE PARTS. IMPEDIMENTS TO PRODUCTION OF PERFECT VOICE.

The artificial palate and velum being completed, the next step is its introduction into the cleft. This is sometimes the source of a little difficulty in very nervous subjects, as the presence of the foreign body (though the mouth will by this time have become less sensitive) cannot be borne under all circumstances with patience.

It is well to try in the elastic velum alone in the first instance, having it attached to a long piece of stout platina wire, one end being fitted into the pinhole previously mentioned. This will allow of its being passed well down at the back of the mouth, in order to get the wings or flaps into their proper relative position without much strain on the soft parts, while, on account of the length of the wire, the operator is able to see well what he is about. The velum can then be drawn for-

ward into its proper place, and held there firmly for a minute, or longer, if the patient can bear it. In most cases this produces no discomfort, while in others there is a feeling of suffocation, in consequence of the greater separation of the mouth from the nose during breathing. If excessive uneasiness be felt at any particular part, the velum must be carefully trimmed away till it becomes easy; and should the portion removed be of any great extent, new castings must be made for the metallic moulds, and another elastic rubber piece vulcanized, in order that there may be no permanent roughness to produce irritation of the mucous membrane. The fit of this portion of the instrument being satisfactory, the hard rubber front piece should be tried in, and adjusted with sufficient nicety for the patient to be able to remove and replace it at pleasure, no metallic bands or wires being used to give it greater firmness, the fact being borne in mind that the use of the front piece is not to support the velum, but to keep it in such a position that it will support itself by means of the overlap above the margins of the front or side of the cleft. When the fit of each part is considered satisfactory, they can be put together, and introduced in the complete form.

At this time it will be found advisable to order

the patient a wash for the mouth of the following composition :—

℞
Potassæ Chloras ʒss.
Eau de Cologne ʒj.
Aqua Rosæ ℥vi.

This may be used three times a day; it will allay any irritation, and make the mouth better fitted for the use of an artificial palate, while at the same time it will check the excessive flow of saliva which is generally present in these cases.

The first discomfort of wearing an instrument in the mouth having been overcome, the question arises as to whether the patients should be put under a systematic course of instruction in regard to the proper use of the tongue and soft palate, or whether they should be allowed to follow their own will and pleasure in the matter.

After some considerable thought and experience in connection with this matter, I find it impossible to lay down any fixed rule upon the subject; there are such varieties of temperament and various degrees of intelligence in the patients presented for treatment with this deformity, that to attempt to be specific in advice would only lead, if followed, to annoyance and perplexity. I shall therefore only put forward such general directions as in practice I have already found beneficial, according

to the different classes of subjects presented to my notice.

With the very nervous and timid patients I always recommend reading aloud,—in the first instance in private, and then before a friend who shall have sufficient discretion to give such an amount of instruction as shall guide the pupil, without causing any agitation in fruitless endeavours to pronounce some difficult letter or sentence.

By this means confidence is gained, and gradually the muscles of the throat and tongue will be got under control, so that not only the power to use these members properly will be acquired, but at the same time there will be the capability of preventing a return to those unnatural movements which the absence of some portion of the palate may have caused.

For those of a hopeful and vigorous turn of mind, a teacher of elocution will be of great service, while others with a quick ear for sound, and impelled by a strong feeling of pride, will make as much, and in some cases more progress, when left to themselves.

There can be no question that, under any circumstances, it is of immense advantage if you can get your patient to sing in a good loud voice with an accompaniment of some musical instrument for a quarter of an hour regularly every

day. The attention is thus diverted, and all the organs of voice and articulation brought into more vigorous action than in ordinary speech, while the fact of the vocal sounds predominating over the secondary or articulate sounds will encourage the patient to persevere, through the defect not being so apparent, while at the same time the tongue and soft palate will almost instinctively assume their normal movements. That this is the case in stutterers and stammerers is a well-known fact, and my experience leads me to believe that similar results (apart from the physical deformity) follow in cleft-palate cases.

There is one very perverse habit that the tongue acquires in some instances, of applying itself constantly to the back of the lower incisor teeth, while at the same time its middle part and base are elevated in an endeavour to close the cleft in the soft palate, and thus produce a more distinct utterance. In several cases the continual pressure at the back of the incisors has caused them to separate and protrude in a very unsightly manner. This is also partly dependent on a want of full development of the lower jaw, which in itself induces increased pressure against the teeth by the tongue. This state of things has been generally accompanied by single or double hare-lip, as well as the split palate. Mr. Skey, in his second edition on "Operative Surgery," page 544,

recommends a pebble being kept in the mouth, or a glass bead tied at the posterior surface of the lower front teeth, as a remedy. This is not so common in patients having simply cleft of the soft palate as when it extends into the hard portion, and there produces deformity, in so far as my own experience has shown; and after treatment by mechanical means, the presence of a foreign body in the roof of the mouth seems to have a beneficial result in regulating this unnatural movement, and causing the tongue to be placed more frequently at the back of the upper incisor teeth, and so assist the perfect articulation of the letters T, S, and others in which the sound is produced by the combined action of these two parts. Where the operation for hare-lip has not been very carefully performed, there is often a triangular space left open on the lips being approximated; just about the spot where union has taken place, as in fig. 27. This is sometimes a source of great trouble to the patient when he tries to produce the labial sounds, as it is next to impossible to get a complete closure so as to give a clear articulation of such letters as B and P. A consideration of this point by the surgeon would no doubt lead to some arrangement of the parts by which this occurrence could be avoided. It would be encroaching upon my readers' time to enlarge upon this part of the treatment of cleft-

palate cases. The necessities and conditions of each case will always be sufficient guide as to whether a professed elocutionist, a friend, or private or solitary effort is the best course to adopt in order to produce clear and intelligible speech.

Fig. 27.

While I, with so many others, confidently assert the attainment of such perfection in speech as shall allow the patient to pass through life without discomfort to himself, or attracting attention, by reason of any peculiarity, from others, still it must not be forgotten there are instances of such weak intellects and highly nervous tem-

peraments, that no treatment in the world can be reasonably expected to be successful.

Where the deformity of the mouth is the result of accident or disease, the reproduction of the lost part will within a few days, and sometimes at once, restore the voice to its natural tone and clearness of expression; in congenital cases the time which must elapse before any result can be realized from the treatment varies from six days to sometimes many weeks, or even a year. The latter are, however, exceptional instances.

CHAPTER VII.

AN ACCOUNT OF CASES OF CLEFT PALATE AND OTHER CONGENITAL DEFORMITIES OF THE MOUTH.

The following cases of congenital cleft palate have been treated on one principle, though not in exactly the same manner.

The object has been in every instance to close, by means of an artificial palate, the defect in the mouth, and at the same time to offer every possible chance to a natural effort to reduce the size of the opening, and not under any circumstances to enlarge it.

I have arranged the cases according to their respective ages, beginning with the youngest, and not according to the dates when they were placed under my care for treatment.

Case I.—John T——; Aet. 4.—Brought to me July, 1868, with fissure of the soft palate and partly of the hard palate also. After some little trouble an impression was obtained, and an artificial palate fitted in as shown in the accompanying wood-cut, fig. 28.

The object and result of fitting in an artificial palate at this early age is to reduce the size of the cleft, and so ultimately render the voice less

indistinct than it would be if allowed to go on untreated.

FIG. 28.

When the cleft is left open, every act of swallowing, by the pressure exerted against the margins of the divided palate, tends to more widely separate them; but if an elastic flap covers the opening, the pressure tends to flatten out the bundles of muscular fibres on each side and push them towards each other. The instrument in the present case has been in use for nearly two years, and the results are most satisfactory. If it be urged that surgical treatment is ultimately a more satisfactory proceeding, this preparation only gives the surgeon a greater chance of success; and for this reason alone would be wise and justifiable to adopt.

A drawing of the mouth without the palate piece is shown in Chapter I. fig. 3.

Case II.—Mary S——; Aet. 7.—Brought to me July, 1868. Fissure of the soft palate only. This case was treated in exactly the same way as the last, the little patient taking the palate out and putting it in again with the greatest ease.

The child was of unusually small stature, and the cleft very diminutive; being confined to the soft palate entirely, it required very careful treatment in so young a subject.

It will be seen from the form of the instrument shown in fig. 29, that the overlap in no way prevents the reduction of the size of the cleft, while it supports the artificial velum independently of the teeth.

FIG. 29.

A. The over-lap resting upon the upper part of the cleft.
B. The flap forming the artificial velum.

The overlap is connected with the flap of elastic rubber forming the artificial palate, by means of a narrow neck, so as to offer no impediment to contraction of the opening.

Case III.—E. A——; Aet. 9.—was brought to me October, 1868, with cleft of soft and portion of hard palate; the speech was very bad, and the

child had a vacant unintelligent stare; with slight deafness in both ears.

The margins of the cleft were thick and widely separated; under no circumstances did they touch the posterior wall of the pharynx. I deemed this a most favourable opportunity for trying the utmost that could be done in the way of approximating the free borders of the cleft, and also spreading out the muscular fibres towards the posterior part of the pharynx. The front part of the arch of the palate was very deep, the teeth good and perfect.

October 28th I fitted in a hard rubber palate plate, just reaching to the apex of the fissure. Strange to say, and greatly to my astonishment, the voice was immediately improved. This was worn for six or seven months; then I extended the posterior border of the plate over about one fourth of the cleft, but without putting any overlap. The child had got such power of suction in the front portion of it, that this was readily kept in place; every two or three months I increased this flap a little, until at the present time the cleft is completely closed by the artificial palate. The front piece fits quite easily, and is the original plate made nearly two years ago, simply having the elastic rubber added to it from time to time. There is no overlap to any portion of the cleft, and the plate depends absolutely on suction for

its support, not even fitting tightly to the necks of the teeth. When the velum is taken out it is most interesting to watch the movements of the sides of the cleft, the muscular fibres of which are flattened and spread out by the pressure from below of the elastic rubber. They can be approximated so as to come into actual contact, and the apices of the bifid uvula rest against the back of the pharynx as in a mouth without any deformity.

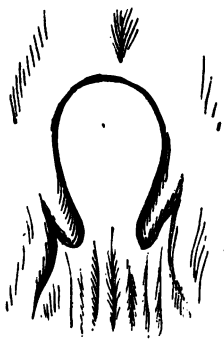

FIG. 30.

FIG. 31.

FIG. 32.

Fig. 30.—Shows the size of the cleft when at rest.

Fig. 31.—Shows the relative position of the parts when they are thrown forward.

Fig. 32.—Shows the "bulging out" and approximation of them towards each other. It is hardly necessary to add, that the speech has considerably improved during the last year and three-quarters, so that the child can go to school and mingle with other children without any difficulty.

Case IV.—W. S.——; Aet. 17.—Brought to me March, 1869, with cleft of both hard and soft palate, complicated with fissure of the alveolus on the left side.

The appearance of the mouth, when fitted with an artificial velum, and the central and lateral incisor teeth, that had not been developed, is shown in fig. 33.

Fig. 33.

By a mistake in drawing this upon the wood, the cleft in the alveolus shows on the right side, whereas, it was really on the left, as most of these are.

It will be seen that I have improved on the manner in which the hard and soft rubber portions are united together, by giving a continuous flush surface to them, instead of allowing the hard rubber to present a prominent ridge in the centre of the palate. Up to the present time this case has gone on exceedingly satisfactorily.

Case V.—Miss F——; Aet. 17.—Seen by me June, 1868, fair complexion, nervous temperament. There was not much sensitiveness as regards the deformity, and unfortunately no ear for musical sounds, though the young lady played several instruments with ordinary accuracy and ability. There was also slight deafness, probably arising from inflammation of the mucous membrane around the Eustachian tubes, the inflammation having arisen from the great exposure of the parts to every change of temperature in consequence of the opening in the palate. The mouth, when presented for treatment, had the appearance shown in fig. 34.

A velum was made which restored the uvula in the lower flap, and in upper flap reproduced the septum of the interior nares where it was absent, also the posterior nares with its two openings.

By these means the mouth, nose, and upper part of the pharynx were restored to their natural condition, and much satisfaction was afforded by the improvement in a very short time, not only

in the facility with which the patient could make herself understood, but also in the tone of the

FIG. 34.

FIG. 35.
The artificial velum and front piece attached by means of the platina pin.

voice, which was unquestionably owing to the alterations that had been produced in the form of the superior part of the pharynx.

FIG. 36.
The mouth, as artificially restored.

Case VI.—D. W.——; Aet 38.—Consulted me in June, 1869, in reference to a cleft in his mouth, extending through the hard and soft palate and alveolar ridge; there was an overlap on one side

of the cleft only, the opposite margin articulating with the vomer.

An instrument was made of the form shown in figs. 37 & 38. The drawings illustrate the

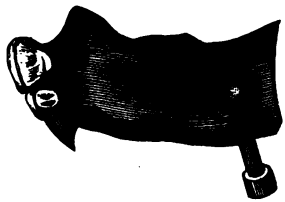

FIG. 37.

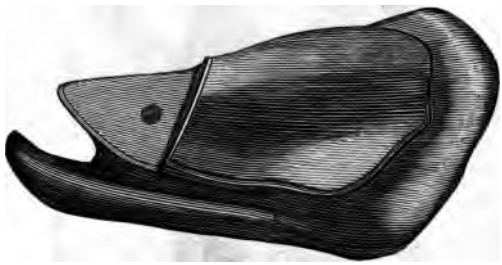

FIG. 38.

manner in which the two parts are united, so as to present a smooth surface in the palate—a point of very great importance, where, under the most favourable circumstances, there is great difficulty in articulating with clearness. In this case it will be seen, as in the previous ones, the artificial velum is held up by the overlap, and not by any attachments round the teeth.

The progress of the patient was quick and satisfactory, as regards improvement in speech.

Case VII.—W. H——; Aet. 68.—Cleft of hard and soft palate, the hare-lip having been treated early in life. I was called in to see this case, in consequence of the patient suffering from a sensation of suffocation very frequently, apparently caused by the passage of cold air between the throat and nostrils; both the upper and lower jaws were without teeth. The appearance of the upper jaw, with the cleft, is shown in Fig. 39.

Fig. 39.

A lower set of artificial teeth was being worn at the time; and I was desired to close the cleft

without producing any irritation in the nasal cavity. I therefore made an ordinary full upper set of teeth, and continued backwards from its posterior border an artificial velum of elastic rubber, simply covering the cleft without any overlap. The form was, however, so simple, that I think it unnecessary to give a drawing of it. The upper piece was connected with the lower by means of spiral springs, and fulfilled the special object it was made for in a most satisfactory manner, the patient having recovered and remained well ever since.

Case VIII.—Miss W.——; Aet. 19.—Brought to me March, 1869, suffering from thickness of speech, and inability to give the letters M, N, B, P, &c., with clearness. The young lady had suffered from enlarged tonsils, and had improved in utterance and general health since they had been removed, but her friends had still great difficulty in understanding her when reading; and when she suffered from cold, even during ordinary conversation, she found a difficulty in making herself understood. The roof of the mouth was very high, and the dental arch much contracted. It was not thought desirable that anything should be done to remedy the contraction of the circle of the teeth, but an artificial palate was made to reduce the roof of the mouth to its normal depth.

Fig. 40 shows in section the peculiarity in the

shape of the palate (*a*, *a*,) and at the same time shows the manner in which it was restored, by means of a hard rubber plate *b*.) Within three

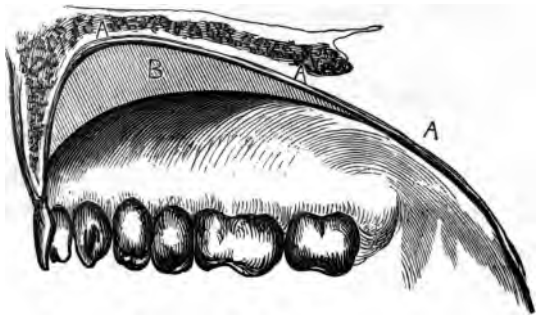

FIG. 40.

weeks the speech was much clearer, and the voice more agreeable in sound. At the present time, while the palate is worn, both voice and speech are almost perfect.

The construction of an instrument for this purpose is so simple that it is not necessary to say more, than that the impression having been taken in plaster of Paris, the palate was restored with wax to the proper shape, and the model put in the flask and packed with rubber in the usual way. After vulcanizing, it was finished off very carefully, so as to give a thin edge to the borders, and not offer any obstruction to the action of the tongue. The portion coming in contact with the palate should be left unpolished, and, in fact,

untouched, beyond washing off the plaster, in order that better suction may be obtained when it is fitted into the mouth.

These cases are very numerous, and with ordinary pains-taking, very successful and satisfactory in their results.

Case IX.—Miss M. R.——; Aet. 12.—Brought to me June, 1869, with elongated palate and projecting incisor teeth. The history of the case showed most unmistakeably that the deformity arose from sucking the thumb during infancy and childhood; and the evidence of the mother—a lady of great intelligence—confirmed this view. She said, when she had severe pain herself, she was in the habit of sucking her thumb as a diversion from the suffering, and her three female children had got into a similar custom, without any occasion but that of imitation. The deformity was not hereditary, as both father and mother had well-formed dental arches, and rather flat than deep palates. I extracted the first bicuspid on each side of the upper jaw, and made a vulcanite plate capping the side teeth, and having a broad band of elastic rubber, vulcanized with it, and passing in front of the incisors and canines, these teeth having been first reduced in the front, in order that sufficient pressure might be brought to bear upon them. In two months the teeth were brought into a fair position, considering the

severity of the case. The projection of the lip was entirely reduced, but the teeth had an appearance—that is not uncommon in these cases—of being too long. The child will probably, however, grow out of this in a few years, as the whole of the face increases in size.

CHAPTER VIII.

DEFECTS OF THE PALATE ARISING FROM SYPHILIS.

Without entering into the medical treatment of syphilitic ulceration, it may not be an unsuitable introduction to give some of the leading features of this affection in the mouth.

Secondary syphilis seldom comes in the way of the dental surgeon, except when the teeth are affected either as a result of treatment or from the disease itself.

In the cases that come under the dental practitioner's notice it is generally observed that either the tongue, fauces, or soft palate are affected. The ulceration is almost invariably symmetrical, and in this differs from tertiary syphilis, as it does also in the manner in which the ulceration takes place.

In secondary syphilis, ulceration proper is rarely present except on the tonsils, but on the tongue there will be observed small symmetrical patches denuded of epithelium along the sides and tip. Occasionally, if neglected, these patches deepen into ulcers, with soft irregular edges—mucous tubercles. Secondary patches, whether mucous

tubercles or condylomata, are always symmetrical as to position. In the tonsils, the disease will sometimes extend into the glandular structure. In secondary syphilis the hard palate is seldom affected beyond the ulceration of the mucous membrane,—necrosis of the bone seldom taking place at this stage of the disease.

The ulceration of tertiary syphilis is of a deep spreading character, with irregular and thickened edges, commencing at the mucous membrane, eating through submucous membrane and periosteum, and leading to necrosis of the bone.

In one case, under the care of my friend Dr. Morell-Mackenzie, the second cervical vertebra was laid bare, and considerable hæmorrhage ensued, apparently from the vertebral artery.

The salivation connected with this disease I need not enlarge upon at the present time. When there is any appearance of puffiness in the palate, an examination with the rhinoscope will generally show whether there is any ulceration of the posterior nares going on, and if there is the slightest appearance of this, the patient must at once be referred to the surgeon for treatment. The use of any gargle, inhalation, or local application with the brush, for the purpose of arresting the disease, is quite beyond the domain of even a dental surgeon who devotes himself specially to the treatment of defects

arising from syphilis and other deformities of the mouth.

Further on I shall mention the preparations that I think one is justified in ordering and applying.

The perforations are generally in the median line, though not always, and are more frequently of an oval than round shape, having their long diameter from back to front. Where perforation takes place in the hard palate, there is frequently —in fact, generally—necrosis of the bone on the nasal surface first, gradually coming downwards, so that the actual perforation shown by the destruction of the membranes on the palatine surface appears to have taken place in an incredibly short time, whereas it will probably be ascertained that the necrosis has gone on for some months previously. In one case a patient showed me a portion of the palatine process of the upper maxilla which had come away through the nose three weeks before there had been any perforation through the mucous membrane of the palate.

There is one peculiarity that I have noticed in perforations of the hard palate that I think is worthy of note. There is not simply a loss of substance clearly defined, but the hole is bevelled off at the expense of its palatine surface, thus giving it a funnel-shaped appearance. This condition is usually found in perforations of the

anterior third of the hard palate. I have never seen anything like it in the more posterior positions, or in the soft palate. Where there is simply a hole through the soft palate, there is generally, and, I have as a rule found, considerable induration and thickening of the parts.

When the ulceration has gone on to such an extent as to produce cleft of the palate, there are often also present strong cicatrices, drawing the cleft widely apart, sometimes in a symmetrical position, and occasionally to one side of the pharynx. In some cases I have seen the uvula adherent to the back of the pharynx, or drawn down to one side, and almost touching the pillars of the fauces; while in others it has been strained forwards and downwards and attached by strong bands of flesh to the sides of the base of the tongue. I have seen, but only rarely, cleft of the palate with but small loss of substance, so that the two halves hung down into the pharynx, and occasionally caused great irritation from coming into contact with the epiglottis, and occasionally entire loss of the soft palate. In the condition of palate I am now describing, examination with the rhinoscope will generally show considerable, if not entire destruction, of the opening of the posterior nares, or, speaking more correctly, the partition of the naso-pharyngeal cavities. The septum will be found

much reduced in depth, and the whole of the upper portion of the space furnishing many points of resemblance to congenital cleft-palate.

Above the margin of the cleft, and springing out from the sides of the pharynx, there are frequently seen large nodulated masses of flesh; having sometimes the appearance of polypi, and not unlikely to be mistaken for them. They are however, simply syphilitic outgrowths, and, once carefully examined, easily recognized again by their hardness to the touch and general consistency. There is one other point only I need touch upon in this portion of my paper, namely, the general tendency of the soft palate especially, to increase in substance when affected by syphilis.

This I consider worthy of the greatest attention, in order that we may take advantage of it in treating perforation of the velum by mechanical means.

Judging from the cases I have treated, perforation of the soft palate is more frequent than that of the hard, while cleft of both hard and soft is more frequent than either. I have treated patients of all ages, from nine to fifty-eight years of age, the largest number being females; and with regard to occupation, most of the men being tailors, and the females needlewomen. This may perhaps occur, however, from the Hospital for Diseases of the Throat (where many of these cases were

treated) being in the immediate vicinity of the dwelling-places of a large number of West-end working tailors.

It is well to mention here that, occasionally, after the palate has been restored to such a state as to enable the patient to speak distinctly as to articulation, still the voice has an exceedingly disagreeable sound. On examining the throat with the laryngoscope, it will probably be found that this arises from some syphilitic affection of the larynx, such as ulceration of the epiglottis or of one or both of the vocal cords, or adhesion of the two vocal cords to each other in a portion of their free borders, thus impeding vocalization; or there may be, as Dr. Morell-Mackenzie has pointed out, paralysis of some of the muscles of the larynx, produced by pressure of cicatrices or injury to a nerve-filament. This I mention to account for want of complete success in some of these cases. Another condition that affects the voice is the deafness often present in these cases, from ulceration or blocking up with growths of the opening of the Eustachian tubes. Some of the instances which I bring forward will show that it is utterly impossible to reproduce the conditions necessary for perfect voice and speech, the difficulties being even greater than in congenital cleft palate. Out of five cases of defects of the palate in patients suffering from hereditary

syphilis, one had the typical notched teeth of Mr. Hutchinson, but the four others had not; the diagnosis of the disease was, however, fairly marked. I may say that, as a rule, we seldom find the notched teeth present in cases suffering from disease of the palate or throat.

Treatment.—There is one rule that I think should be strictly adhered to in all cases of perforation of the hard and soft palate, and in most cases of cleft of the hard and soft palate, when it arises from ulceration, and that is, never to introduce anything into the cavity of the perforation or cleft for permanent use. The tendency of the parts is to grow together, and thus gradually obliterate the opening.

Anything rising above the lower margin has the effect of checking this, and ultimately increasing rather than reducing the size of the space. In all these cases it is most essential that nothing shall be done to produce irritation and set up ulceration again.

The surface of the rubber coming next to the part of the palate where there is an opening must be highly polished, so that no chafing may take place. It should be flat rather than convex, so as to offer every inducement to the parts to come together.

I think the earlier these cases are treated the better they succeed, both as to the general health

and the object we have specially in view, of remedying the defect in the palate. The plate preserves the parts from the irritation of foreign bodies, and the membranes are in such a condition as to grow more rapidly than under ordinary circumstances they would do.

I think it safest, and therefore best, to use black rubber for the plates, in order to avoid any possibility of injurious effects arising from the colouring matter used in the manufacture of the ordinary red dental rubber. For cleft and perforations of the velum, it is generally necessary to use elastic rubber, but wherever it is possible to use hard rubber it is more efficient, if it be desired to reduce the size of an opening.

On this account, I sometimes use hard rubber for the front of the palate; then a hinge formed of elastic rubber, and then hard rubber again beyond. This involves a little trouble in making, but the satisfactory results amply repay for the extra labour.

All the cases are held in position by the perfect fit of the plates to the mouth and teeth. I do not use bands or metallic collars round the teeth, and I never depend for the support of the pieces on any overlap to be obtained on the upper borders of the palate. In all cases of syphilis I think this is too great a risk to run. When the perforation is in the hard palate, the

plate may be made of such a shape as to cover it without unnecessarily encroaching on the roof of the mouth; when the opening is in the soft palate, the rubber should extend about $\frac{1}{8}$ to $\frac{1}{4}$ in. beyond the sides and back of the cavity. A case of this nature is shown in fig.

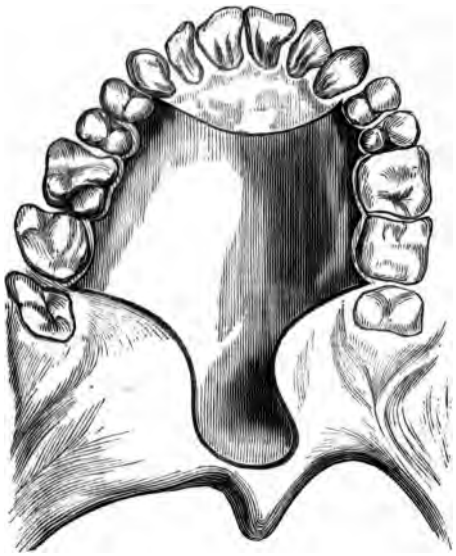

Fig. 41.

When there is a cleft, with the remains of the velum on each side attached to, and continuous with, the pharynx, it is neither possible nor desirable to close the cleft. The object here should be to stimulate the rigid margins and cicatrices into muscular action, in order that the naso-pharyngeal cavities may be separated at will. The

hard rubber—for that is generally the best in the first instance, though elastic rubber may be used subsequently—should be fitted to within $\frac{1}{16}$ in. round the sides, and $\frac{1}{8}$ to $\frac{1}{4}$ in. at the portion coming in front of the posterior wall of the pharynx. The object of the difference in the dimensions of these spaces is that we desire to utilize and increase the lateral contractile power, while we leave the muscles at the back of the pharynx in their normal condition, simply letting them touch the border of the obturator without impinging.

It must be borne in mind that it is most essential for the health of the patient that the mucus of the nose should not be allowed to accumulate to an unnatural degree, by the complete closure of the space between the posterior nares and mouth; added to which, it is necessary to avoid the chance of the artificial palate being thrown out of position by the tilting up of the margin coming in contact with the pharynx.

In two cases, where there were no teeth in the upper jaw, the obturator was held in position by means of spiral springs attached to a lower piece. I may state here, that I deem it advisable to remove any bad stumps that may be present in the mouth, as well as any accumulation of tartar; thus reducing the chances of irritation of the gums.

The models are as usual taken in plaster of

Paris, but as there are occasionally perforations too large to be covered with gold beater's skin (to prevent the plaster entering), there is a risk of some considerable portion of it remaining in the opening when the impression is removed. I have, therefore, had constructed an instrument fashioned like a lithotrite, which, by being introduced into the opening, enables the operator to crush the plaster, and then remove it with a pair of tweezers, and afterwards wash away the fragments with a syringe and warm water.

This instrument is shown in Fig. 42.*

Fig. 42.

Making the Palate Plates.—For all practical purposes, hard and elastic rubber may be vulcanized together, providing the temperature is sufficiently high to thoroughly cook the hard rubber.

The elastic rubber does not suffer from this increased temperature in elasticity, but in power of resisting the acids of the mouth. Still, it is sometimes desirable to put up with this dis-

* Made by Meyer & Mezler, Great Portland Street.

advantage, on account of the other benefits to be derived from the practice. It is necessary when this is done to vulcanize on metallic moulds, either fitted in a flask or held together by a clamp.

The model having been cast in plaster, is moulded in sand and cast carefully in type-metal, in the same way that zinc models are made for striking up gold plates. All that portion of the palate which has been recently the seat of ulceration is well polished, so as to bring it up to a high metallic surface.

Then, instead of mounting up the form of the plate in wax, as you would do on a plaster model, use modelling clay tolerably dry, that is, as dry as it can be worked conveniently. When it is nicely finished up, and has the form the artificial palate is to have in rubber, whether hard or soft, it is placed by the fire and gradually dried and made warm on the type-metal model; it is afterwards placed in a casting-ring, with sand round it—in the same way that we proceed for making the lead counterpart for plate work—and type-metal poured in. This saves the time and trouble of making a plaster model first, and also insures a more accurate fit of the two castings.

All the surface of this last casting is thoroughly polished, so as to give a smooth surface to the rubber. The rubber is afterwards packed in according to the position that you desire the hard

and elastic portions of it to occupy. It is then fixed in a clamp and vulcanized.

The only local application for the mouth I use is tannin and glycerine, for the purpose of hardening the parts if they are tender. Any treatment beyond this I leave in the hands of the surgeon or physician.

The numbers of the various cases I have treated I have put in a tabulated form :—

Of perforations in the hard palate there were	12
In the soft palate	13
Cleft, involving both hard and soft palate	17
Making a total of	42

Of these, 29 were females, 20 being married women, and 11 males. 13 were suffering from secondary syphilis, and 24 from tertiary syphilis; 5 from hereditary syphilis.

In regard to the success I have met with out of the 42 cases—In 31 cases the speech has been restored, though in some the voice has been of a disagreeable tone. In 7 cases the voice and speech have not been rendered perfect, from the nature of the deformity not permitting of a symmetrical restoration of the parts, without which but little can be done. The curative effect, if I may use such an expression, goes on occa-

sionally in cases of perforation of the soft palate in a very rapid manner. In three cases especially, the opening was reduced to one-third the original size in less than two months, as shown in the accompanying wood-cuts.

FIG. 43. FIG. 44. FIG. 45.

FIG. 43. Appearance of opening when placed under my care for treatment.

FIG. 44. Appearance after the plate had been worn for two months.

FIG. 45. Appearance of the opening reduced to the diameter shown in wood-cut, twelve months after treatment.

The cuts, Figs. 43 & 44 are one-half the natural size.

The two following cases may perhaps be advantageously reported separately as they are both of a very severe character.

Sophia S——; Aet. 32.—Applied at the Hospital for Diseases of the Throat for treatment of severe ulceration and loss of parts at the back of the mouth. Nearly the whole of the velum palati had disappeared, the anterior and posterior pillars of the fauces were likewise destroyed, so that the roof of the mouth presented the appearance of

continuance backwards to the posterior wall of the pharynx, as shown in fig. 46.

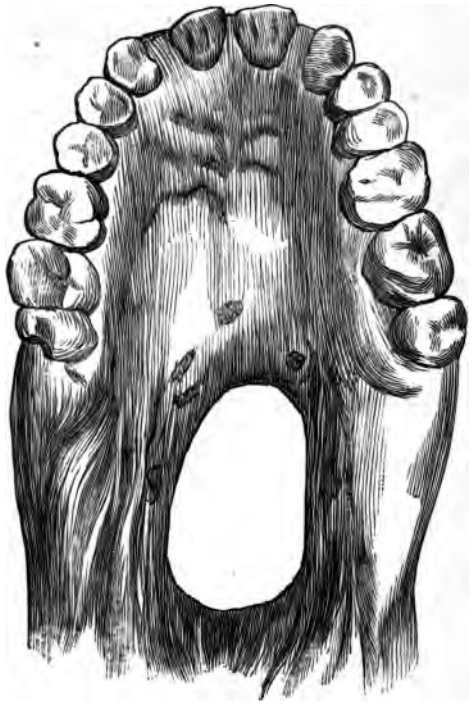

FIG. 46.
Showing cicatrices and old syphilitic scars in front of fissure.

In the position that would be occupied by the uvula and central portion of the soft palate, when elevated for dividing the mouth from the nose, there was a large opening of an oval form, about one and a quarter of an inch in extent one way, and three-quarters of an inch from side to side. In swal-

lowing, there was not the slightest movement at the back of the mouth, except in the tongue, which was the only member that could contribute any assistance to the process of conveying the food to the opening into the œsophagus. The back of the mouth was in this way kept in a very irritable condition by the continual lodgment of food in the cleft. From the state of the palate, speech was scarcely intelligible, and the life of the poor woman was in every way a matter of considerable discomfort. Owing also to the great induration of the parts on each side, where the indications of the anterior pillars of the fauces were apparent, I concluded that no power could be obtained to work an elastic velum with any service or comfort, while at the same time there was the consideration to be borne in mind that the disease was still going on, and it was desirable rather to protect the parts from the irritation resulting from food, &c., than to increase the trouble by having an artificial velum, that must necessarily produce some chafing, the mucous membrane being so exceedingly sensitive. A simple hard rubber obturator was therefore made, partially closing the aperture, and having the inner surface highly polished. This has been very satisfactory in its results.

William T——, engineer; Aet. 37.—In this case the upper maxillary bone was destroyed on the left side from the central tooth to the

second molar tooth, following the line of the intermaxillary suture, and the connection of the palate-bone with the upper maxilla. The septum of the nose was quite perfect, articulating with the maxillary bone of the opposite side. The turbinated bones of the left side, with the walls of the antrum, were entirely destroyed up to the floor of the orbit, leaving a gap for restoration by artificial means of considerable extent. The voice was very imperfect, mastication and swallowing very difficult. The appearance of the case is shown in fig. 47.

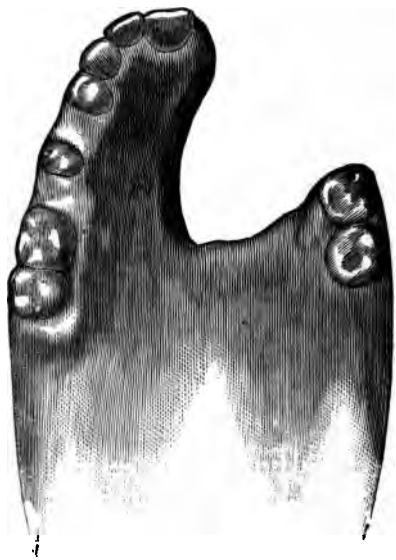

Fig. 47.

The instrument that was constructed to remedy

these defects is shown complete, ready for wear, in fig. 48; also with the parts separated, showing how far the hard rubber extended, and where the elastic india-rubber was connected with it, in order that the more delicate parts might not be irritated.

FIG. 48.

The parts connected ready for wear.

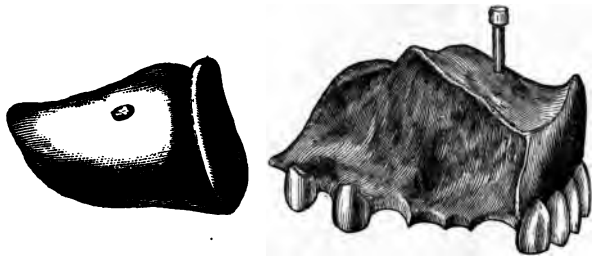

FIG. 49.

The parts divided showing the means by which the elastic rubber pad is united to the hard rubber palate plate.

The means that were adopted were not only satisfactory, but immediate in their result—speech was restored at once to its normal tone and dis-

tinctness. Gargling the throat and mouth (before impossible) were now accomplished with ease, while by the restoration of the teeth to their natural state the patient's appearance was very much improved. The appearance of the mouth after treatment is shown in fig. 50.

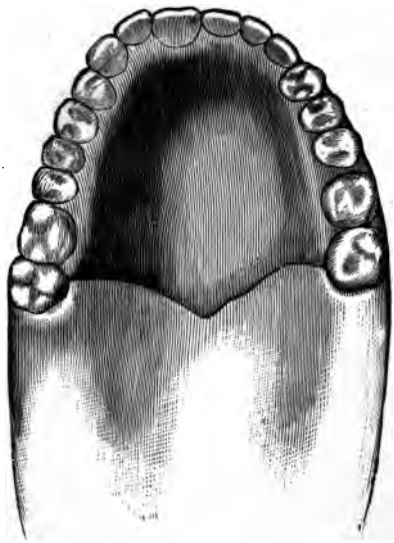

FIG. 50.
The mouth as artificially restored.

EXPLANATION OF PLATE SHOWING AFFECTIONS OF THE PALATE ARISING FROM HEREDITARY SYPHILIS.

FIG. 1.—R. M.——; Aet. 18.—Cleft of hard and soft palate, and perforation of hard palate; the cleft is divided into two by a narrow band on the one side.

FIG. 3.—Shows the typical notched teeth described by Mr. Jonathan Hutchinson, as characteristic of this disease, but rarely seen in connection with any loss of the palate.

FIG. 2.—W. G.——; Aet. 20.—Perforation of hard palate; the bones of the nose had been destroyed to a very great extent, so that the depth of the palate was increased by loss of a portion of the floor of the nasal cavity. The free borders of the soft palate (the whole of which was drawn upwards and forwards) was attached to the posterior wall of the pharynx, so as to completely shut off all communication with the nose.

FIG. 4.—Shows the epiglottis of the same patient, bifurcated, whether congenital, or from ulceration, could not be decided.

FIG. 5.—W. M.——; Aet. 12.—Perforation of hard palate, cleft of hard and soft palate, and attachment of the lateral fibres to the sides of the pharynx.

FIG. 6.—M. R.——; Aet. 8.—Extensive destruction of soft palate, and extreme tension of the margins towards the sides of the pharyngeal wall.

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EXPLANATION OF PLATE SHOWING SYPHILITIC AFFECTIONS OF THE PALATE.

FIG. 1.—Perforation of hard palate, septum of nose seen through the opening. Tertiary syphilis.

FIG. 2.—Cleft of soft palate involving portion of hard palate; the sides of the cleft are continuous with the sides of the pharynx. Tertiary syphilis.

FIG. 3. Very severe form of cleft of hard and soft palate, showing out-growths attached to the side of the pharyngeal wall.

FIG. 4.—Cleft of soft palate, showing extreme tension from old cicatrices, the margins of the cleft being attached to the sides of the base of the tongue. Secondary syphilis.

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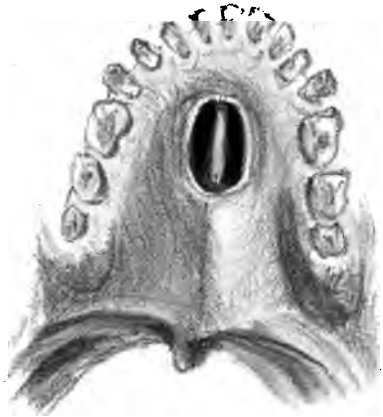

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CHAPTER IX. AND APPENDIX.

CONCLUSIONS AS TO THE BEST MODE OF TREATING DEFORMITIES OF THE MOUTH, BASED ON THE TREATMENT OF FIFTY-EIGHT CASES BY THE AUTHOR.

I have endeavoured in the previous chapters to confine myself to a simple statement of facts. With regard to the cases I have reported, written as they have been in the intervals of practice, I have not been able to follow out in every instance the principle which I have always adopted. I have deemed it well rather to stimulate, and then utilize, natural movements of the defective parts, than to introduce an instrument that should depend for its efficacy on some abnormal movement. Throughout it has been my endeavour to avoid, in any way, injuring the organs involved in the deformity. Although the treatment has always been mechanical, it has been, as far as possible, based on physiological principles.

Satisfactory as the results of the past have been, I do not feel at all disposed to say that we have arrived at perfection in this department of dentistry. We have yet to obtain a material having a less specific gravity, and a greater

power of resistance to the acids of the mouth, than that which we at present possess.

An extended field of observation has led me to the conclusion, that the weight of artificial obturators is often a source of great discomfort to the wearer.

I trust, at no very distant period, that we may have some better means of teaching in a more efficient manner, those who have defective speech, produced by physical, rather than functional causes.

Much as I believe in the soundness of that system of curative dentistry introduced recently by Dr. Norman Kingsley, and followed out since by so many others besides myself, I am by no means wedded to my belief to such an extent as to undervalue the merits of the surgical operation for congenital cleft palate. In a previous portion of this volume, I have pointed out a fact, which I would again draw attention to, that it was on the discoveries made by Sir William Fergusson, that Mr. Snell, in 1848, based the construction of that instrument of which Dr. Kingsley's is a more perfect example. I am fully prepared to admit, that provided the conditions of the parts be suitable, the surgical operation being done once for all, is superior to any mechanical contrivance that must necessarily be renewed from time to time. The question, therefore, turns on

what is a suitable condition of the parts for operation.

They may be very briefly stated :—

(1) A sufficient substance on each side of the cleft to admit of freely paring the edges.

(2) An amount of mobility that will admit of the free borders easily approximating.

(3) A sufficient length of the central portion of the cleft palate to produce perfect closure between the naso-pharyngeal cavities.

I believe all physiologists and surgeons will agree with me, that unless these conditions be present, it will be impossible, after the operation is completed, for the patient to acquire perfect speech. If the deformity is such, that after the cleft is closed, the free border of the soft palate cannot be brought into contact with the posterior wall of the pharynx, it is vain to expect that a perfect articulation will be attainable by the person operated upon.

Holding the views I do in reference to the two modes of treatment, the object of my experiments with reference to Cases I. II. III. and IV., Chapter VII., will be more readily understood.

In that Chapter (VII.) I have given reports of the more special and characteristic deformities of the mouth, choosing one of most interest from each class. Throughout I have considered the time of my readers, and have not hesitated to call

in the Engraver's aid when I found I could more readily convey information with the pencil than the pen.

In Chapter VIII. I have reproduced, with some additions, a paper that I had the honour of reading before the Odontological Society early in the present year, simply altering the form of some of its passages to suit the different circumstances under which it is again brought forward.

The earlier chapters of the present revised edition having been prepared some time ago, I was unable to insert, in its proper place, a case of great interest that I was enabled to see, some three months back, under the care of my friend Mr. Berkeley Hill—a babe three weeks old, the appearance of whose mouth is shown in the coloured plate (4) inserted in Chapter II. The deformity was of a most severe character, and after keeping the little babe alive by means of an artificial palate and feeder for seven weeks, it at last died; it never at any time weighed more than 4½ lbs., and at death weighed 3½ lbs. As will be seen by reference to the plate, there was little more than the alveolar ridge developed, added to which the infant was so exceedingly delicate, that from the first but small hopes were entertained of saving its life. The only other case of equal severity that I have seen is in the museum of King's College, a drawing of which

I have been kindly allowed to make by permission of the Council.

This is shown in the accompanying woodcut, fig. 51.

FIG. 51. Skull of a Fœtus with cleft palate.

In conclusion, I have to thank many friends for assistance rendered in the preparation of this volume, and especially Mr. Harrison and Mr. Gregson, for much interesting information in reference to the past history of inventions for remedying defects of the palate.

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A CLASSIFIED INDEX

TO

MESSRS. CHURCHILL & SONS' CATALOGUE.

ANATOMY.

PAGE

Anatomical Remembrancer .. 7
Flower on Nerves 16
Hassall's Micros. Anatomy .. 19
Healc's Anatomy of the Lungs 19
Heath's Practical Anatomy .. 20
Holden's Human Osteology .. 20
Do. on Dissections 20
Huxley's Comparative Anatomy 21
Jones' and Sieveking's Pathological Anatomy 22
MacDougal—Hirschfeld on the Nervous System v
Maclise's Surgical Anatomy .. 25
St. Bartholomew's Hospital Catalogue 31
Sibson's Medical Anatomy .. 33
Waters' Anatomy of Lung .. 37
Wheeler's Anatomy for Artists 38
Wilson's Anatomy 39

CHEMISTRY.

Bernays' Notes for Students .. 9
Bloxam's Chemistry 10
Bowman's Practical Chemistry 10
Do. Medical do. .. 10
Fownes' Manual of Chemistry .. 16
Do. Actonian Prize 16
Do. Qualitative Analysis .. 16
Fresenius' Chemical Analysis .. 17
Galloway's First Step 17
Do. Second Step 17
Do. Analysis 17
Do. Tables 17
Griffiths' Four Seasons 18
Horsley's Chem. Philosophy .. 21
Mulder on the Chemistry of Wine 27
Plattner & Muspratt on Blowpipe 28
Shuttleworth's Modern Chemistry 32
Speer's Pathol. Chemistry .. 34
Sutton's Volumetric Analysis . 34

CLIMATE.

Bennet's Winter in the South of Europe 9
Chambers on Italy 12
Dalrymple on Egypt 14
Francis on Change of Climate .. 16
Hall on Torquay 19
Haviland on Climate 19
Horton on West Coast of Africa 21
Lee on Climate 24
Do. Watering Places of England 24
McClelland on Bengal 25
McNicoll on Southport 25
Martin on Tropical Climates .. 26
Moore's Diseases of India .. 26
Patterson's Egypt and the Nile 28
Scoresby-Jackson's Climatology 32
Shapter on South Devon 32
Siordet on Mentone 33
Taylor on Pau and Pyrenees .. 35
Williams on South of France .. 38

DEFORMITIES, &c.

PAGE

Adams on Spinal Curvature .. 6
Do. on Clubfoot 6
Bigg's Orthopraxy 10
Bishop on Deformities 10
Do. Articulate Sounds .. 10
Brodhurst on Spine 11
Do. on Clubfoot 11
Godfrey on Spine 17
Hugman on Hip Joint 21
Salt on Lower Extremities .. 31
Tamplin on Spine 35

DISEASES OF WOMEN AND CHILDREN.

Ballard on Infants and Mothers 7
Bennet on Uterus 9
Bird on Children 10
Eyre's Practical Remarks .. 15
Harrison on Children 19
Hood on Scarlet Fever, &c. .. 21
Kiwisch (ed. by Clay) on Ovaries 13
Lee's Ovarian & Uterine Diseases 24
Do. on Speculum 24
Ritchie on Ovaries 31
Seymour on Ovaria 32
Tilt on Uterine Inflammation .. 36
Do. Uterine Therapeutics .. 36
Do. on Change of Life 36
Underwood on Children 37
Wells on the Ovaries 38
West on Women 38
Do. (Uvedale) on Puerp. Diseases 38
Wright on Uterine Disorders .. 39

GENERATIVE ORGANS, Diseases of, and SYPHILIS.

Acton on Reproductive Organs 6
Coote on Syphilis 14
Gant on Bladder 17
Hutchinson on Inherited Syphilis 22
Lee on Syphilis 24
Oppert on Syphilis 27
Parker on Syphilis 27
Wilson on Syphilis 39

HYGIENE.

Armstrong on Naval Hygiene 7
Beale's Laws of Health 8
Do. Health and Disease .. 8
Carter on Training 12
Chavasse's Advice to a Mother .. 13
Do. Advice to a Wife .. 13
Dobell's Germs and Vestiges of Disease 15
Fife & Urquhart on Turkish Bath 16
Gordon on Army Hygiene .. 17
Granville on Vichy 18
Hartwig on Sea Bathing 19

HYGIENE—*continued.*

PAGE

Hartwig on Physical Education 19
Hufeland's Art of prolonging Life 21
Hunter on Body and Mind .. 21
Lee's Baths of France, Germany, and Switzerland 24
Lowndes on the Maintenance of Health 25
Moore's Health in Tropics .. 26
Parkes on Hygiene 27
Parkin on Disease 28
Pearse's Notes on Health 28
Pickford on Hygiene 28
Robertson on Diet 31
Routh on Infant Feeding 31
Tunstall on Bath Waters 36
Wells' Seamen's Medicine Chest 38
Wife's Domain 38
Wilson on Healthy Skin 39
Do. on Mineral Waters .. 39
Do. on Turkish Bath 39

MATERIA MEDICA and PHARMACY.

Bateman's Magnacopia 8
Beasley's Formulary 9
Do. Receipt Book 9
Do. Book of Prescriptions 9
Birch on Oxygen 10
Brunton on Digitalis 11
Frazer's Materia Medica 16
Nevins' Analysis of Pharmacop. 27
Pereira's Selecta è Præscriptis 28
Prescriber's Pharmacopœia .. 29
Royle's Materia Medica 31
Squire's Hospital Pharmacopœias 34
Do. Companion to the Pharmacopœia 34
Steggall's First Lines for Chemists and Druggists 34
Stowe's Toxicological Chart .. 34
Taylor on Poisons 35
Waring's Therapeutics 37
Wittstein's Pharmacy 39

MEDICINE.

Adams on Rheumatic Gout .. 6
Addison on Cell Therapeutics .. 6
Do. on Healthy and Diseased Structure 6
Aldis's Hospital Practice 6
Anderson (Andrew) on Fever .. 7
Austin on Paralysis 7
Barclay on Medical Diagnosis .. 8
Do. on Gout 8
Barlow's Practice of Medicine 8
Basham on Dropsy 8
Brinton on Stomach 11
Do. on Intestinal Obstruction 11
Budd on the Liver 11

MEDICINE—*continued.*

PAGE

Budd on Stomach 11
Camplin on Diabetes 12
Catlow on Æsthetic Medicine .. 12
Chambers on the Indigestions 12
Do. Lectures 12
Cockle on Cancer 13
Dale's Practical Medicine 14
Davey's Ganglionic Nervous Syst. 15
Day's Clinical Histories 15
Eyre on Stomach 15
Fenwick on the Stomach 16
Fuller on Rheumatism 16
Gairdner on Gout 17
Gibb on Throat 17
Do. on Laryngoscope 17
Granville on Sudden Death .. 18
Griffith on the Skin 18
Gully's Simple Treatment .. 18
Habershon on the Abdomen .. 18
Do. on Mercury 18
Hall (Marshall) on Apnœa .. 18
Do. Observations .. 18
Headland—Action of Medicines 19
Do. Medical Handbook 19
Hooper's Physician's Vade-Mecum 18
Inman's New Theory 22
Do. Myalgia 22
James on Laryngoscope 22
Jencken on Cholera 22
Jones (Bence) on Pathology and Therapeutics 22
Maclachlan on Advanced Life .. 25
MacLeod on Acholic Diseases .. 25
Macleod's Ben Rhydding 25
Marcet on Chronic Alcoholism . 25
Macpherson on Cholera 26
Markham on Bleeding 26
Morris on Germinal Matter .. 26
Meryon on Paralysis 26
Mushet on Apoplexy 27
Nicholson on Yellow Fever .. 27
Parkin on Cholera 28
Pavy on Diabetes 28
Do. on Digestion 28
Peet's Principles and Practice of Medicine 28
Roberts on Palsy 31
Robertson on Gout 31
Sansom on Cholera 32
Savory's Domestic Medicine .. 32
Semple on Cough 32
Seymour on Dropsy 32
Shaw's Medical Remembrancer 32
Shrimpton on Cholera 32
Smee on Debility 33
Steggall's Medical Manual .. 34
Thomas' Practice of Physic .. 35
Thudichum on Gall Stones .. 35
Todd's Clinical Lectures 36
Tweedie on Continued Fevers 36
Walker on Diphtheria 37
What to Observe at the Bedside 25
Williams' Principles 38
Wright on Headaches 39

MICROSCOPE.

Beale on Microscope in Medicine 9
Carpenter on Microscope 12
Schacht on do. 32

MISCELLANEOUS.

Acton on Prostitution 6
Barclay's Medical Errors 8

MISCELLANEOUS—*cont.*

PAGE

Bascome on Epidemics 8
Buckle's Hospital Statistics .. 11
Cooley's Cyclopædia 13
Edwards' Photographs 15
Gordon on China 17
Graves' Physiology and Medicine 17
Guy's Hospital Reports 17
Harrison on Lead in Water .. 19
Hingeston's Topics of the Day .. 20
Howe on Epidemics 21
Lane's Hydropathy 23
Lee on Homœop. and Hydrop. 24
London Hospital Reports 25
Mayne's Medical Vocabulary .. 26
Oppert on Hospitals 27
Part's Case Book 28
Redwood's Supplement to Pharmacopœia 30
Ryan on Infanticide 31
St. George's Hospital Reports .. 31
Simms' Winter in Paris 33
Snow on Chloroform 33
Waring's Tropical Resident at Home 37
Whitehead on Transmission .. 38
Wise's Med. amongst Asiatics .. 38

NERVOUS DISORDERS AND INDIGESTION.

Althaus on Epilepsy, Hysteria, &c. 7
Birch on Constipation 10
Carter on Hysteria 12
Downing on Neuralgia 15
Hunt on Heartburn 21
Jones (Handfield) on Functional Nervous Disorders 22
Leared on Imperfect Digestion 23
Lobb on Nervous Affections .. 24
Morris on Irritability 26
Radcliffe on Epilepsy 30
Reade on Syphilitic Affections of the Nervous System 30
Reynolds on the Brain 30
Do. on Epilepsy 30
Rowe on Nervous Diseases .. 31
Sieveking on Epilepsy 33
Turnbull on Stomach 36

OBSTETRICS.

Barnes on Placenta Prævia .. 8
Hodges on Puerperal Convulsions 20
Lee's Clinical Midwifery 24
Do. Consultations 24
Leishman's Mechanism of Parturition 24
Pretty's Aids during Labour .. 29
Priestley on Gravid Uterus .. 30
Ramsbotham's Obstetrics 30
Sinclair & Johnston's Midwifery 33
Smellie's Obstetric Plates 33
Smith's Manual of Obstetrics .. 33
Swayne's Aphorisms 34
Waller's Midwifery 37

OPHTHALMOLOGY.

Cooper on Injuries of Eye .. 13
Do. on Near Sight 13
Dalrymple on Eye 14

OPHTHALMOLOGY—*cont.*

PAGE

Dixon on the Eye 15
Hogg on Ophthalmoscope .. 20
Hulke on the Ophthalmoscope 21
Jago on Entoptics 22
Jones' Ophthalmic Medicine .. 23
Do. Defects of Sight 23
Do. Eye and Ear 23
Macnamara on the Eye 25
Nunneley on the Organs of Vision 27
Power's Illustrations of Diseases of the Eye 29
Solomon on Glaucoma 38
Walton on the Eye 37
Wells on Spectacles 38
Wolfe on Cataract 39

PHYSIOLOGY.

Carpenter's Human 12
Do. Manual 12
Heale on Vital Causes 19
Richardson on Coagulation .. 30
Shea's Animal Physiology 32
Virchow's (ed. by Chance) Cellular Pathology 12

PSYCHOLOGY.

Arlidge on the State of Lunacy 7
Bucknill and Tuke's Psychological Medicine 11
Conolly on Asylums 13
Davey on Nature of Insanity .. 15
Dunn on Psychology 15
Hood on Criminal Lunatics .. 21
Millingen on Treatment of Insane 26
Murray on Emotional Diseases 27
Noble on Mind 27
Sankey on Mental Diseases .. 31
Winslow's Obscure Dis. of Brain 39

PULMONARY and CHEST DISEASES, &c.

Alison on Pulmonary Consumption 6
Bright on the Chest 10
Cotton on Stethoscope 14
Davies on Lungs and Heart .. 14
Dobell on the Chest 15
Do. on Tuberculosis 15
Do. on Winter Cough 15
Do. First Stage of Consumption 15
Fenwick on Consumption 16
Fuller on the Lungs 16
Do. on Heart 16
Jones (Jas.) on Consumption .. 23
Laennec on Auscultation 23
Markham on Heart 26
Peacock on the Heart 28
Pirrie on Hay Asthma 29
Salter on Asthma 31
Skoda on Auscultation 26
Thompson on Consumption .. 35
Timms on Consumption 36
Turnbull on Consumption .. 36
Waters on the Chest 37
Do. on Emphysema 37
Weber on Auscultation 38

RENAL and URINARY DISEASES.

	PAGE
Acton on Urinary Organs	6
Beale on Kidney Diseases	9
Bird's Urinary Deposits	10
Coulson on Bladder	14
Hassall on Urine	19
Parkes on Urine	27
Thudichum on Urine	35
Todd on Urinary Organs	36

SCIENCE.

Baxter on Organic Polarity	8
Bentley's Manual of Botany	9
Brooke's Natural Philosophy	11
Craig on Electric Tension	14
Hardwich's Photography	19
Hinds' Harmonies	20
Howard on the Clouds	21
Jones (Bence) on Matter and Force	22
Jones (Wharton) on Vision	23
Do. on Body, Sense, and Mind	23
Mayne's Lexicon	26
Noad on the Inductorium	27
Pratt's Genealogy of Creation	29
Do. Eccentric & Centric Force	29
Do. on Orbital Motion	29
Do. Astronomical Investigations	29
Do. Oracles of God	29
Price's Photography	30
Rainey on Shells	30
Reymond's Animal Electricity	30
Taylor's Medical Jurisprudence	35
Unger's Botanical Letters	37
Vestiges of Creation	36

SURGERY.

	PAGE
Adams on Reparation of Tendons	6
Do. Subcutaneous Surgery	6
Anderson on the Skin	7
Ashton on Rectum	7
Brodhurst on Anchylosis	11
Bryant on Diseases of Joints	11
Do. Clinical Surgery	11
Callender on Rupture	12
Chapman on Ulcers	12
Do. Varicose Veins	12
Clark's Outlines of Surgery	13
Collis on Cancer	13
Cooper (Sir A.) on Testis	14
Do. (S.) Surg. Dictionary	14
Coulson on Stone in Bladder	14
Curling on Rectum	14
Do. on Testis	14
Druitt's Surgeon's Vade-Mecum	15
Fayrer's Clinical Surgery	15
Fergusson's Surgery	16
Do. Progress of Surgery	16
Gamgee's Amputation at Hip-joint	17
Gant's Principles of Surgery	17
Gay on Varicose Disease	17
Heath's Minor Surgery and Bandaging	20
Do. on the Jaws	20
Higginbottom on Nitrate of Silver	20
Hodgson on Prostate	20
Holt on Stricture	21
James on Hernia	22
Do. on Inflammations	22
Jordan's Clinical Surgery	23
Lawrence's Surgery	23
Do. Ruptures	23
Lee on the Rectum, &c.	24
Liston's Surgery	24
Logan on Skin Diseases	24

SURGERY—*continued.*

	PAGE
Macleod's Surgical Diagnosis	25
Do. Surgery of the Crimea	25
Maclise on Fractures	25
Maunder's Operative Surgery	26
Nayler on Skin Diseases	27
Nunneley on Erysipelas	27
Pirrie's Surgery	29
Pirrie & Keith on Acupressure	29
Price on Excision of Knee-joint	29
Ramsay and Coles on Deformities of the Mouth	30
Salt on Rupture	31
Sansom on Chloroform	32
Smith (Hy.) on Stricture	33
Do. on Hæmorrhoids	33
Do. on the Surgery of the Rectum	33
Do. (Dr. J.) Dental Anatomy and Surgery	33
Spender on Ulcers	34
Squire on Skin Diseases	34
Steggall's Surgical Manual	34
Teale on Amputation	35
Thompson on Stricture	35
Do. on Prostate	35
Do. Lithotomy and Lithotrity	35
Tomes' Dental Surgery	36
Wade on Stricture	37
Webb's Surgeon's Ready Rules	37
Wilson on Skin Diseases	39
Do. Portraits of Skin Diseases	39
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